
The CLM Book - Optimized Component Lifecycle Management with Sonatype CLM

Contents

1	Component Lifecycle Management	1
1.1	Introduction	1
1.2	Increasing Component Usage and Open Source Components	2
1.3	Security Vulnerability and License Compliance Risks	2
1.4	Complicating Factors for CLM	2
1.5	Stages of CLM Adoption and Performance	3
1.6	Requirements for CLM	5
1.7	Sonatype and Sonatype CLM	6
1.7.1	Who is Sonatype?	6
1.7.2	What is Sonatype CLM?	6
1.7.3	How does Sonatype CLM work?	7
1.7.4	Which component ecosystems does Sonatype CLM support?	7

1.8	Conclusion	8
2	Sonatype CLM Server	9
2.1	Introduction	9
2.2	Preparation and Installation	10
2.2.1	Hardware Prerequisites and Recommendations	10
2.2.2	Software Requirements	11
2.2.2.1	Operating System and Java Runtime Environment	11
2.2.2.2	Browser	11
2.2.3	Download	11
2.2.4	Installation	11
2.2.5	Starting CLM Server	12
2.2.6	License Installation	13
2.2.7	CLM Server Directories	15
2.2.8	Running CLM Server as a Service	15
2.2.9	Backup	18
2.2.10	Upgrading	19
2.3	Configuration	19
2.3.1	Initial Configuration of CLM Server	20

2.3.2	Running the CLM Server Behind a HTTP Proxy Server	20
2.3.3	Setting the Base URL	21
2.3.4	Appending a User Agent String	21
2.3.5	File Configuration	22
2.3.6	Email Configuration	22
2.3.7	Logging Configuration	23
2.3.8	HTTP Configuration	23
2.3.9	HTTPS/SSL	23
2.3.10	Anonymous Access	24
2.4	User Management	24
2.4.1	Logging in to Sonatype CLM	25
2.4.2	Viewing Notifications	25
2.4.3	Changing the Admin Password	26
2.4.4	Creating a User	27
2.4.5	Editing and Deleting User Information	28
2.5	LDAP Integration	29
2.5.1	Configuring the LDAP Server Connection	29
2.5.2	LDAP Configuration Parameters	31

2.5.3	Mapping LDAP Users to Sonatype CLM	33
2.5.4	LDAP User Parameters	34
2.5.5	Mapping LDAP Groups to Sonatype CLM	35
2.5.6	LDAP Group Parameters	37
2.5.6.1	Static Groups	37
2.5.6.2	Dynamic Groups	38
2.5.7	Verifying LDAP Configuration	39
2.5.7.1	Test Connection	39
2.5.7.2	Check User and Group Mapping	40
2.5.7.3	Check Login	40
2.6	Role Management (Permissions) Overview	41
2.6.1	Role Definitions	41
2.6.2	Mapping Roles	42
2.6.3	Excluding Groups from Search Results	43
2.7	Conclusion	44
3	Sonatype CLM Policy Management	46
3.1	Introduction	46
3.2	What is a Policy?	47

3.2.1	Basic Policy Anatomy	47
3.2.2	Organizations, Applications and Inheritance	48
3.2.3	Summary	49
3.3	Organization and Application Management	50
3.3.1	Organizational Structure	50
3.3.2	Creating an Organization	51
3.3.3	Creating an Application	52
3.3.4	Organization, Application, and Inheritance	53
3.3.5	The Power of Inheritance	54
3.3.6	Avoiding Policy Micromanagement	54
3.3.7	Permissions and Roles	55
3.3.8	Summary	55
3.4	Policy Development	56
3.4.1	Advanced Anatomy of a Policy	56
3.4.2	Risk and Organizational Intent	59
3.4.3	Summary	59
3.5	Policy Creation	60
3.5.1	Getting Started	60

3.5.2	Step 1: Understand the Policy Intent	62
3.5.3	Step 2: Decide on a Descriptive Policy Name	62
3.5.4	Step 3: Choose an Appropriate Threat Level	63
3.5.5	Step 4: Choose the Application Matching Parameters	65
3.5.6	Step 5: Create Constraints with Conditions	65
3.5.7	Step 6: Set Policy Actions And Notifications	70
3.5.7.1	Actions	70
3.5.7.2	Notifications	71
3.5.7.3	Stages	72
3.5.8	Summary	74
3.6	Policy Elements	74
3.6.1	What is a Label?	75
3.6.2	Creating, Editing and Deleting a Label	75
3.6.3	Creating a Condition Based on a Label	77
3.6.4	What is a License Threat Group?	78
3.6.5	Creating, Editing, and Deleting a License Threat Group	79
3.6.6	Creating a Condition Based on a License Threat Group	82
3.6.7	Creating a Condition Based on an Unassigned License Threat Group	82

3.6.8	What is a Tag?	83
3.6.9	Creating, Editing, and Deleting Tags	85
3.6.10	Applying a Tag	87
3.6.11	Matching Policies to Specific Applications	88
3.6.12	Viewing Tag-based Policies	89
3.6.13	Summary	90
3.7	Manual Application Evaluation	90
3.7.1	Evaluating via the CLM Server	91
3.7.2	Successful Evaluations and Report Generation	92
3.7.3	Summary	93
3.8	Reviewing Evaluation Results	94
3.8.1	Accessing the Application Composition Report	94
3.8.2	Reviewing the Report	96
3.8.3	Summary	101
3.9	Importing Policies	101
3.9.1	Sonatype Sample Policy Set	102
3.9.2	Importing a Policy to an Organization	102
3.9.3	Importing a Policy to an Application	104

3.9.4	Summary	105
3.10	Policy Monitoring	105
3.10.1	Setup Policy Monitoring for an Application	106
3.10.2	Configuring Notification Times	110
3.10.3	Summary	110
3.11	Conclusion	110
4	Reports in Sonatype CLM	112
4.1	Introduction	112
4.2	Application Composition Report Overview	112
4.2.1	Accessing an Application Composition Report	114
4.2.2	Reviewing a Report	116
4.2.3	Summary Tab	117
4.2.4	Policy Tab	119
4.2.5	Security Issues Tab	121
4.2.6	License Analysis Tab	122
4.2.7	Printing and Reevaluating the Report	123
4.2.8	The Component Information Panel (CIP)	123
4.2.9	Summary	130

4.3	Resolving Security Issues	131
4.3.1	Security Issues	131
4.3.2	The Component Information Panel (CIP)	132
4.3.3	Editing Vulnerability Status	133
4.3.4	Matching to Violations	135
4.3.5	Summary	136
4.4	License Analysis Tab	136
4.4.1	License Threat Group	137
4.4.2	License Analysis	138
4.4.3	The Component Information Panel (CIP)	138
4.4.4	Editing License Status and Information	140
4.4.5	Summary	141
4.5	Component Identification	142
4.5.1	Matching Components	143
4.5.2	Managing Proprietary Components	144
4.5.3	Claiming a Component	147
4.5.4	Summary	149
4.6	Label Overview	149

4.6.1	Where do labels begin?	150
4.6.2	Assigning a Label	151
4.6.3	Summary	152
4.7	Waivers	153
4.7.1	A Use Case for Waivers	153
4.7.2	Adding a Waiver	155
4.7.3	Viewing and Removing a Waiver	156
4.7.4	Summary	157
4.8	Policy Reevaluation	158
4.8.1	Summary	159
4.9	Sonatype CLM PDF Report	159
4.9.1	Creating the PDF	159
4.9.2	Reviewing the PDF	160
4.9.3	Summary	170
4.10	Conclusion	170
5	Sonatype CLM Server - Dashboard	172
5.1	Introduction	172
5.2	Accessing the Dashboard	173

5.3	Viewing CLM Data in the Dashboard	174
5.3.1	Filters	174
5.3.2	Visual Overview	178
5.3.3	Highest Risk Violations	181
5.3.3.1	Newest	181
5.3.3.2	By Component	183
5.3.3.3	By Application	185
5.4	Viewing Component Details	187
5.5	Conclusion	188
6	Sonatype CLM and Continuous Integration	190
6.1	What is Continuous Integration (CI)?	190
6.2	Sonatype CLM and Continuous Integration	191
6.3	Sonatype CLM for Hudson and Jenkins	191
6.3.1	Introduction	191
6.3.2	Installation	192
6.3.3	Global Configuration	193
6.3.4	Job Configuration	195
6.3.5	Inspecting Results	197

6.3.6	Conclusion	199
6.4	Sonatype CLM and Other CIs	199
6.5	Conclusion	200
7	Sonatype CLM for IDE	201
7.1	Introduction	201
7.2	Installing Sonatype CLM for Eclipse	202
7.3	Configuring Sonatype CLM for Eclipse	204
7.4	Using the Component Info View	208
7.4.1	Overview	208
7.4.2	Filtering the Component List	213
7.4.3	Searching for Component Usages	214
7.4.4	Inspecting Component Details	214
7.5	Migrating to Different Component Versions	215
7.6	Conclusion	219
8	Sonatype CLM for Repository Managers	220
8.1	Introduction	220
8.2	Nexus Pro - Sonatype CLM Edition	221
8.3	Nexus Pro and Sonatype CLM Integration	223

8.3.1	Introduction	223
8.3.2	Repository Health Check (RHC) vs. Sonatype CLM	223
8.3.3	Connecting Nexus to CLM Server	224
8.3.4	Configuring the CLM Server	226
8.3.5	Accessing CLM Component Information	227
8.3.6	The Component Information Panel (CIP)	230
8.3.7	Component Details (CLM)	233
8.4	Using CLM for Staging	234
8.4.1	Introduction	234
8.4.2	Staging Profile Configuration	235
8.4.3	Policy Actions	236
8.4.4	Release Repository Actions	238
8.5	Using Sonatype CLM for Maven	239
8.6	Conclusion	239
9	Sonatype CLM for SonarQube	240
9.1	Introduction	240
9.2	Sonatype CLM for SonarQube Requirements	241
9.3	Downloading, Installing, and Configuring	241

9.3.1	Install Sonatype CLM for SonarQube	242
9.3.2	Configure Sonatype CLM Server Settings	243
9.3.2.1	A Special Note About Proxy Configuration	244
9.3.3	Select the CLM Application	244
9.3.4	Add and Configure the Sonatype CLM Widget	245
9.4	Accessing the Application Composition Report	247
9.5	Conclusion	247
10	Sonatype CLM for CLI	248
10.1	Introduction	248
10.2	Downloading Sonatype CLM for CLI	249
10.3	Locating Your Application Identifier	249
10.4	Evaluating an Application	250
10.4.1	Additional Options	251
10.5	Example Evaluation	251
10.6	Using Sonatype CLM for CLI with a CI Server	253
10.7	Conclusion	253
11	Sonatype CLM for Maven	255
11.1	Introduction	255

11.2 Creating a Component Index	256
11.2.1 Excluding Module Information Files in Continuous Integration Tools	257
11.3 Creating a Component Info Archive for Nexus Pro CLM Edition	258
11.4 Evaluating Project Components with Sonatype CLM Server	259
11.5 Authentication	262
11.6 Simplifying Command Line Invocations	263
11.7 Skipping Executions	263
11.8 Using Sonatype CLM for Maven with Other IDEs	264
11.8.1 Maven Plugin Setup	264
11.8.2 IntelliJ IDEA	265
11.8.3 NetBeans IDE	267
11.9 Conclusion	269
A Copyright	271

List of Figures

2.1	Installing a Product License on Sonatype CLM Server	13
2.2	Sonatype CLM Server End User License Agreement Window	14
2.3	Installed Product License on Sonatype CLM Server	14
2.4	Login	25
2.5	Create User	27
2.6	Edit User	28
2.7	Sample LDAP Server Configuration	31
2.8	User Mapping	34
2.9	Group Mapping	37
2.10	Dynamic Group Options	39
2.11	Testing LDAP Server	39
2.12	Checking User Mapping	40

2.13 Checking User Login	40
2.14 Mapping Users to roles	43
2.15 Mapping Groups When Not Included With Search	44
3.1 Using New Organization button	51
3.2 Using Global Create Button	51
3.3 Using New Application button	52
3.4 Using Global Create Button	52
3.5 Editing a Policy and its Attributes	57
3.6 Using New Policy Button	61
3.7 Using Global Create Button	61
3.8 Naming the Policy	63
3.9 Editing the Policy Threat Level	64
3.10 Example Constraint	66
3.11 Adding Constraints	67
3.12 Policy Actions Example	71
3.13 Policy Notifications Example	72
3.14 Using New Label Button	76
3.15 Using Global Create Button	76

3.16 Label Example	77
3.17 Creating a Label Condition	78
3.18 Using New License Threat Group Button	80
3.19 Using Global Create Button	80
3.20 Creating a License Threat Group	81
3.21 Creating a Condition Evaluating a License Threat Group	82
3.22 Creating a Condition Evaluating an unassigned License Threat Group	83
3.23 Example of Applied Tags	84
3.24 Using New Tag Button	85
3.25 Using Global Create Button	85
3.26 Creating a Tag	86
3.27 Example of Tags with Description	87
3.28 Evaluate an Application	92
3.29 Violations Report after Scan	93
3.30 Reporting Area	95
3.31 Application Area	96
3.32 Summary Tab of an Application Composition Report	97
3.33 Policy Tab of an Application Composition Report	98

3.34 Security Issues Tab of an Application Composition Report	98
3.35 License Analysis Tab of an Application Composition Report	99
3.36 Component Information Panel CIP for a Specific Component	99
3.37 Policy Section for a Specific Component Displayed on the Component Information Panel	100
3.38 Organization View with Import Button	103
3.39 Import Policy Dialog	104
3.40 Example of a Policy Monitoring Email	106
3.41 Access Application Management Area	107
3.42 Selecting a Sonatype CLM Stage to Monitor	108
3.43 Adding Email Recipient	108
3.44 Policy Monitoring Notification Example	109
3.45 Sample Email Notification	109
4.1 Summary Tab of the Application Composition Report	113
4.2 Reporting Area	115
4.3 Application Area	116
4.4 The Four Tabs	116
4.5 Security Issues Summary	118
4.6 License Analysis Summary	119

4.7 Policy Tab	120
4.8 Security Issues Tab	121
4.9 License Analysis Tab	122
4.10 Application Composition Report Buttons For Printing and Reevaluation	123
4.11 Component Information Panel CIP Example	124
4.12 CIP, Policy Section	126
4.13 CIP, Similar Section	126
4.14 CIP, Occurrences Section	127
4.15 CIP, Licenses Section	128
4.16 CIP, Edit Vulnerabilities Section	128
4.17 CIP, Labels Section	129
4.18 CIP, Claim Component	129
4.19 CIP, Audit	130
4.20 Security Issues Tab	132
4.21 Component Information Panel (CIP)	133
4.22 Security Information Modal	134
4.23 Editing Vulnerabilities	135
4.24 Example of Component with Security Issue, but No Policy Violation	135

4.25 License Analysis Tab	137
4.26 The Default License Threat Groups	137
4.27 Component Information Panel (CIP)	139
4.28 Editing License Using the Select Option	140
4.29 Unknown Component	142
4.30 Filter and Matching Options	143
4.31 Proprietary Component	144
4.32 Proprietary Packages Configuration via the Sonatype CLM Server	146
4.33 Claim a Component	147
4.34 Claimed Component Indicator	148
4.35 Update or Revoke Claimed Component Indicator	148
4.36 Labels at the CLM Server Level	150
4.37 Assigning a Label	152
4.38 Waiver Visualization on Policy Tab	154
4.39 Waiver Button	155
4.40 Options to Apply Waiver to the Application or the Entire Organization	156
4.41 View and Remove Waivers	157
4.42 Application Composition Report Buttons For Printing and Reevaluation	158

4.43 Summary Section of a Application Composition Report in PDF Format	161
4.44 Policy Violations Section of a Application Composition Report in PDF Format	163
4.45 Security Issues Section of a Application Composition Report in PDF Format	165
4.46 License Analysis Section of a Application Composition Report in PDF Format	167
4.47 Components Section of a Application Composition Report in PDF Format	169
5.1 Dashboard Default View	173
5.2 Accessing the Dashboard	174
5.3 Dashboard Filter Example	175
5.4 Filtering the Dashboard	176
5.5 Dashboard Visuals	178
5.6 Counts	178
5.7 Matches	179
5.8 Policy Violation Summary	180
5.9 Newest Risk	182
5.10 Highest Risk - By Component	183
5.11 Highest Risk - By Application	185
5.12 Component Detail Page	187
6.1 Jenkins Global Configuration Menu	192

6.2	Global Configuration of Sonatype CLM for CI in Jenkins	193
6.3	Sonatype CLM Build Scan Configuration for a Build Step	195
6.4	Post-build Action Configuration as Example for a Sonatype CLM for CI Configuration	197
6.5	Job Overview Page with Links to the Application Composition Report and Application Management	198
6.6	Left Menu with Link to the Application Composition Report	199
7.1	Eclipse Dialog to Install New Software with Sonatype CLM for Eclipse	203
7.2	Activating the Component Info View of Sonatype CLM for Eclipse	204
7.3	Warning after initial installation	205
7.4	Sonatype CLM for Eclipse Configuration Dialog	206
7.5	Example Component Info View	208
7.6	Details for a Component in the Component Info View	210
7.7	Properties of a Component for a Version Range	212
7.8	Filter Dialog for the Component Info View	213
7.9	Example Component Details Display	215
7.10	Migrating to a Newer Component Version	216
7.11	Applying a Dependency Version Upgrade	217
7.12	Selecting Dependency Version or Property Upgrade	217

7.13 Applying a Property Upgrade	218
8.1 The Central Role of A Repository Manager in Your Infrastructure	221
8.2 CLM configuration tab in Nexus	225
8.3 CLM configuration tab after Test Connection	226
8.4 Typical Search Results in Nexus Pro	227
8.5 Nexus Search Showing All Versions	228
8.6 Accessing the Component Info Tab	229
8.7 Component Information Panel	230
8.8 Component Information Panel Example	231
8.9 CIP Text	231
8.10 CIP Graph	232
8.11 View Details Button	233
8.12 View Details	234
8.13 Staging Profile with a CLM Application Configured	236
8.14 Staging and Release Configuration for a Policy in the CLM Server	237
8.15 Staging Repository Activity with a CLM Evaluation Failure and Details	238
9.1 SonarQube Overview	241
9.2 SonarQube Plugin Directory	242

9.3	SonarQube Settings Menu	243
9.4	SonarQube CLM Server Settings	243
9.5	SonarQube Sonatype CLM Configuration Menu	245
9.6	SonarQube Sonatype CLM Application Selection	245
9.7	SonarQube Configure Widgets Menu	245
9.8	SonarQube Search for CLM Widget	246
9.9	SonarQube Configure Sonatype CLM Widget options	246
9.10	SonarQube Sonatype CLM Widget Example	247
10.1	Application Overview and Application Identifier	249
10.2	Violations Report After an Evaluation	252
11.1	Creating a Maven Run Configuration for a CLM Evaluation in IntelliJ	266
11.2	Maven Projects View with the CLM Evaluation Run Configuration in IntelliJ	266
11.3	CLM for Maven Output in the Run Console in IntelliJ	267
11.4	Project View with the <code>pom.xml</code> in NetBeans	268
11.5	Maven Goal Setup for a CLM Evaluation in NetBeans	268
11.6	CLM for Maven Output in the Output Window in NetBeans	269

List of Tables

3.1 Threat Levels	63
-----------------------------	----

:numbered

Preface

Learn about the concepts and practices of component lifecycle management in general and specifically usage of the Sonatype CLM suite of tools.

Last updated and published on 2015-06-15.

:

Chapter 1

Component Lifecycle Management

1.1 Introduction

Component lifecycle management can be defined as the **practice of**

- **analyzing,**
- **controlling,** and
- **monitoring**

the components used in your software development lifecycle.

It has emerged as a new category of software development products, information services, and practices that help manage agile and collaborative, component-based development efforts. With modern component lifecycle management, you are able to ensure the integrity of the modern software supply chain and amplify the benefits of modern development, all while reducing risk.

1.2 Increasing Component Usage and Open Source Components

Modern software development practices have shifted dramatically from large efforts of writing new code, to the precise usage of components to assemble applications. This approach limits the amount of code authorship to the business-specific aspects of your software.

As such, a large number of open source components in the form of libraries, reusable widgets, whole applications, application servers, and others are now available. These components are of a high quality, and support use cases that could not be implemented as a side-effect of your business application development. For example, creating a new web application framework and business workflow system just to create a website with a publishing workflow would be extremely inefficient.

Because of these changes and move to efficiency, open source has become an integral part of modern applications. So much so, that a typical enterprise application is now comprised of tens, if not hundreds, of components, which accounts for 80% and more of the application.

1.3 Security Vulnerability and License Compliance Risks

With the huge benefits derived from using open source, as well as commercial components, comes the complexity of understanding all the implications they have to your software delivery. This includes security vulnerabilities, license compliance problems, and quality issues, all of which need to be managed through the whole life cycle. This starts at the inception of the application all the way through development, quality assurance, production deployments, and even on through decommissioning of the application.

Given the number of components, their rapid change rate, and the ease of adding new dependencies, it quickly becomes clear that the management and full understanding of all components associated with an application is a daunting task, one that can not be carried out manually. Luckily, this is simplified with the assistance of tools such as Sonatype CLM.

1.4 Complicating Factors for CLM

As the owner of a specific application you are responsible for any license, security and quality issues arising. For the common approach of a component based software product, one that reuses a lot of

externally available components, this means you are not only responsible for your source code, but also for any issues originating from the components you used.

Needless to say, tracking all these components and potential issues is complicated due to a number of factors, including:

Complexity

A typical application relies on a number of components, that in turn rely on others, which builds up a complex dependency graph that can be hard to grasp and manage without proper tooling.

Diversity

The number of components available from open source projects is staggering and continuously rising, together with the choice of commercial components, you are faced with a hugely diverse set of choices. All of which will impact your CLM efforts.

Adaptability

Component authors strive to provide a rapid rate of innovation, which brings you a larger number of benefits. Unfortunately, this rate of change means that you need to keep up in order to stay current, and take advantage of new features as well as fixes. Not to mention, many times new feature mean new issues.

1.5 Stages of CLM Adoption and Performance

When endeavoring to initially implement, and subsequently establish, CLM as an ongoing process, a number of stages and actions are commonly required:

Integrate Sonatype CLM Sample Policy

What can tend to be the most difficult part to new users of Sonatype CLM is something that is developed outside the application, policies. Policies are a set of rules that you expect a component to meet as it relates to a particular application. These rules should include the level of risk you are willing to accept. Given this, policies starts as a statement of what you do and do not desire to be included in your applications. This is something that is dynamic though. Meaning, that over time your policies will change and evolve to adapt to your business. So, instead of trying to determine that all upfront, make your first stage on of seeking out the sample policies we've provided to get you started.

Improve Component Selection

With policies created (or hopefully the sample policies implemented), it can be enticing to begin calling a full stop on development when something negative is found. While that is an approach, it's not the recommended path. Instead, start by only implementing the developer set of CLM tools.

This will allow you to expose your development teams to the information that Sonatype CLM has. When they encounter components that would violate a policy, it will be apparent. They will also be able to easily select alternatives, by quickly finding the best version. Development teams want to do the best job they can, and this stage puts them first and foremost in improving your applications, they way it should be.

Establish Component Inventory and Governance

The component selection phase allowed the development team to make better choices for components they use. Now that they are familiar with the type of information the Sonatype CLM provides, it is time to start tracking the inventory and approval of components used in applications that make up the enterprise.

Sonatype CLM provides tools to integrate into the build release management systems to validate and ensure the components in use are Sonatype CLM policy approved components. Governance sets the expectations of what components will be approved and allows for starting the dialog, with the Development teams, to provide business justification for why a risky component should be allowed.

Monitor Component Usage

At this point, you will also need to make sure security and licensing policies have been established, and are continually reviewed and updated. This works most effectively if carried out during your ongoing development efforts, as well as for any components already in production. Ultimately, this will allow you to both preemptively address any issues, or react to any that are newly discovered. Remember to evaluate your applications often, and at major milestones during development (e.g. during builds and when staging a release). In this final stage, you should begin to consider putting gates, which Sonatype CLM provides, making sure a balance between ongoing fluid development and releasing software with unwanted components is achieved.

Integrate Sonatype CLM Sample Policy

What can tend to be the most difficult part to new users of Sonatype CLM is something that is developed outside the application, policies. Policies are just the rules that you expect a component to meet as it relates to a particular application. Given this, policies starts as a statement of what you do and do not desire to be included in your applications. This is something that is dynamic though. Meaning, that over time your policies will change and evolve to adapt to your business. So, instead of trying to determine that all upfront, make your first stage on of seeking out the sample policies we've provided to get you started.

Improve Component Selection

With policies created (or hopefully the sample policies implemented), it can be enticing to begin calling a full stop on development when something negative is found. While that is an approach, it's not the recommended path. Instead, start by only implementing the developer set of CLM tools. This will allow you to expose your development teams to the information that Sonatype CLM has. When they encounter components that would violate a policy, it will be apparent. They will also be able to easily select alternatives, by quickly finding the best version. Development teams want to do the best job they can, and this stage puts them first and foremost in improving your applications, they way it should be.

Establish Component Inventory and Governance

By this time, your development team should be familiar with the kind of information that Sonatype CLM provides. Now, you can begin to gather a complete list of all components that are being used. Sonatype CLM tools provided at both the command line and GUI level, will allow a developer to evaluate an application they are working on and see a manifest of the components being used. In addition, this stage is perfect for starting the conversation over why a particular risky component, that is one that violates a high risk policy is being used, rather than an alternative.

Monitor Component Usage

Once an understanding of the components that are being used has been established, it is important to keep that understanding current and updated. At this point, you will also need to make sure security and licensing policies have been established, and are continually reviewed and updated. This works most effectively if carried out during your ongoing development efforts, as well as for any components already in production. Ultimately, this will allow you to both preemptively address any issues, or react to any that are newly discovered. Remember to evaluate your applications often, and at major milestones during development (e.g. during builds and when staging a release). In this final stage, you should begin to consider putting gates, which Sonatype CLM provides, making sure a balance between ongoing fluid development and releasing software with unwanted components is achieved.

1.6 Requirements for CLM

Precise

identify components, exactly, even when altered

Actionable

provide detailed security, quality, and licensing information to be able to make conclusions and take action

Complete

analyze the entire component including dependencies

Update Aware

notify users of new versions with detailed update reasoning

Integrated

blend seamlessly with existing software development lifecycle tools

1.7 Sonatype and Sonatype CLM

With process of CLM outlined, you clearly begin to see the need for a set of tools that can integrate into this new way of thinking. This is where Sonatype and Sonatype CLM come into play. Of course that presents several new questions:

- Who is Sonatype?
- What is Sonatype CLM?
- How does Sonatype CLM Work?
- Which component ecosystems does Sonatype CLM support?

1.7.1 Who is Sonatype?

Maven, Nexus, and The Central Repository are perhaps the most familiar names associated with Sonatype, and Sonatype CLM is the newest name to join these ranks.

If you're interested in the Sonatype story, head over to our web page, and read all [about Sonatype](#) and the best place to [get started](#).

1.7.2 What is Sonatype CLM?

Sonatype CLM is the suite of tools and products dedicated to optimizing your component lifecycle management efforts. We do this by offering products which allow different stake holders and participants to collaborate on their CLM efforts, with suitable, easy-to-use tools that add value across the enterprise.

In essence we are working to do away with the scan and scold mentality of managing components. Instead we want to provide your teams with the information they need, early in the development process. We believe that being able to make informed decisions when selecting components is essential to success.

Sonatype CLM supports a number of different tasks and activities, including, but not limited to:

- Development in an IDE

- Build via Continuous Integration Servers
- Release Management
- Production Monitoring

This integration can vary from embedded GUI interfaces all the way to custom plugins and command line functionality. The real thing to remember is that no matter what system you are using, Sonatype CLM can find a way to evaluate your application and deliver the necessary information to everyone involved.

1.7.3 How does Sonatype CLM work?

Sonatype CLM makes use of Sonatype's HDS (Hosted Data Services) which logs security, license, and architecture information for supported open source component ecosystems.

This information is, in some cases exclusive to Sonatype (i.e. the Central Repository), and in all cases, constantly being refined using the most up-to-date sources as possible.

The type of information available for components can vary, but generally revolves around these three:

- Security Vulnerabilities
- License Analysis
- Architecture (e.g. Age, Popularity and Usage)

1.7.4 Which component ecosystems does Sonatype CLM support?

Sonatype CLM isn't just about Java components, though that's where we started. As you will see, we also provide detailed information for other component systems, such as NuGet (associated with Microsoft .Net Development), as well. A brief description of each is provided below.

The Central Repository and Java

Managed by Sonatype, the Central Repository (or "Central") is the largest repository of components for the Java ecosystem. It is the default repository in Apache Maven, which is the most widely used build system for Java development. It is also available as a repository in most other build systems as a component source.

Of course, Central isn't the only repository we collect information on, access to additional repositories is available as well.

NuGet and the .NET Framework

Originally founded by Microsoft, but now independently managed by the [Outcurve foundation](#), NuGet provides open source components for .NET development.

In cooperation with Microsoft and NuGet, Sonatype's HDS regularly reviews NuGet packages to match any known issues related to license, security, and architecture.

1.8 Conclusion

You have likely heard, "We work with customers just like you." In many ways this is often true. While the internal workings of our businesses are different, the problems we are looking to solve (or resolve) are quite similar. Given this, we too have worked with customers just like you.

This is a good thing though. The information presented here, as well as in all of our materials, and even the design of Sonatype CLM all is heavily influenced by what our customers request. In this fashion, we have set our primary goal to providing you with solutions that let you do what you do best, develop great software. Through that, we are here to support and guide your efforts with the best information possible.

So, whether your journey toward component lifecycle management has just started, or in some cases may be well on its way, we're here to help. If at any point you feel we missed something, or have questions you can't find answers to, don't hesitate contacting us. Good luck, and we look forward to hearing about your success.

The Sonatype CLM Team

Chapter 2

Sonatype CLM Server

2.1 Introduction

The Sonatype CLM Server is the central component of your Sonatype CLM implementation. It allows you to create and store policies, manage access, set configuration items, and review the effect of your policies through a variety of reports.

In addition, it will be the centralized location for ensuring seamless integration to systems such as Eclipse (IDE integration documented in Chapter [7](#)), Hudson / Jenkins (the continuous integration server usage documented in Chapter [6](#)), and/or the integration with Nexus (repository manager documented in Chapter [8](#)).

The following chapter will provide everything you need to install and deploy the Sonatype CLM server, as well as make sure you can setup and define access for your team.

2.2 Preparation and Installation

2.2.1 Hardware Prerequisites and Recommendations

Sonatype CLM Server is typically deployed on a dedicated server. More specific hardware requirements are ultimately a function of the deployment architecture, the primary usage patterns and the scale of deployment.

With these influencing factors in mind, we recommend a modern processor speed with at least 8 CPU cores and 8GB of physical RAM for initial setup. A minimum of 6GB of process space should be available to the CLM server. Additional RAM can improve the performance due to decreased disk caching.

As an example a Sonatype CLM Server deployment at Sonatype is using a Dual Intel Xeon E5620 with 2.4Ghz, 12M Cache, 5.86 GT/s QPI, Turbo, HT.

Storage requirements range with the number of applications projected to use the CLM server. For less than 1000 applications 200GB is recommended. Between 1000 and 2000 applications we suggest to use 500GB. Above 2000 applications we suggest to provide 1TB of storage.

Tip

Monitoring disk-space usage will help you gauge the storage needs in your actual deployment and react to growing demands in time.

Sonatype CLM Server is an I/O intensive application and disk speed will affect the performance of the CLM server considerably. We therefore recommend to use local drives or SAN usage. Usage of network mapped storage via NFS or similar is not recommended. It is important to consider the I/O load when running CLM server in a virtual machine, especially when other virtual machines on the same host are running other I/O intensive applications e.g. the Nexus repository manager.

Development, test or evaluation deployments can be scaled smaller than the above recommendations and will continue to function, while a minor performance degradation can be observed.

2.2.2 Software Requirements

2.2.2.1 Operating System and Java Runtime Environment

Sonatype CLM server requires a 64bit operating system due to its memory requirements. Otherwise there are no specific requirements besides the availability of a JRE.

Sonatype CLM requires a Java 7 runtime environment, Update 21 or higher from [Oracle](#). We recommend usage of the Server JRE.

A list of supported operating systems for the JRE is available from [Oracle](#).

2.2.2.2 Browser

The Sonatype CLM Server exposes a web application for administration and configuration as well as for viewing reports. Usage of this application requires Microsoft Internet Explorer 9 or higher or any other modern browser like newer versions of Mozilla Firefox, Google Chrome or Apple Safari.

2.2.3 Download

The latest release of the CLM Server can be downloaded from the [Sonatype support website](#) and is available as `.tar.gz` or `.zip` archive. The contents of the two files are identical and you can choose to download either one. Successful download should result in files named `sonatype-clm-server-xyz-bundle.tar.gz` or `sonatype-clm-server-xyz-bundle.zip`, where `xyz` is the version of the latest release e.g. `1.11.0-01` or `1.10.2`.

2.2.4 Installation

After a successful download of the CLM server bundle archive, you should create an installation directory in the desired location and move the archive into the directory.

```
cd /opt  
mkdir sonatype-clm-server  
mv ~/Downloads/sonatype-clm-server.* sonatype-clm-server/
```

```
cd sonatype-clm-server
```

Moving into the directory and extracting the archive with either one of the commands:

```
unzip sonatype-clm-server*.zip  
tar xfvz sonatype-clm-server*.tar.gz
```

should result in a directory with the following files:

```
README.txt  
config.yml  
demo.bat  
demo.sh  
eula.html  
sonatype-clm-server-1.10.2-bundle.tar.gz  
sonatype-clm-server-1.10.2.jar
```

2.2.5 Starting CLM Server

Once the CLM server is installed, it can be started with:

```
cd /opt/sonatype-clm-server  
java -jar sonatype-clm-server-*.jar server config.yml
```

This command will start the server with the Sonatype CLM Server application using the configuration from the config.yml file and logging any output straight to the console. After a complete start your console should display a message similar to:

```
... [main] org.eclipse.jetty.server.AbstractConnector - Started ←  
    InstrumentedBlockingChannelConnector@0.0.0.0:8070  
... [main] org.eclipse.jetty.server.AbstractConnector - Started ←  
    SocketConnector@0.0.0.0:8071
```

The command to start the server can be modified by adding java configurations parameters such as –Xmx1024m –XX:MaxPermSize=128m to improve performance and adapt to the server hardware.

At this stage you can access the web application at port 8070 of your server via any web browser. Initial startup will display a screen for the Section [2.2.6](#).

2.2.6 License Installation

Sonatype CLM server requires a license to be installed. The required license file will be supplied to you by the Sonatype support team in the form of a `.lic` file.

Open a web browser and navigate to the CLM server web application at port 8070 to install the license. Opening the URL, e.g. for a localhost deployment at <http://localhost:8070>, displays the Product License Configuration of the CLM server shown in Figure 2.1.

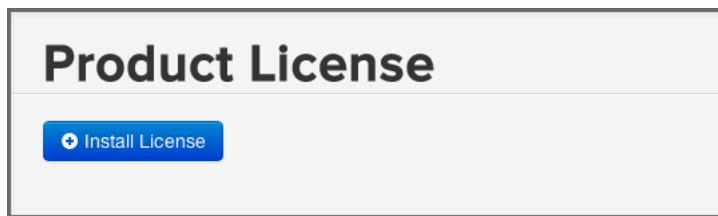


Figure 2.1: Installing a Product License on Sonatype CLM Server

Press the *Install License* button and select the `.lic` file in the file selector. As a next step you are required to accept the end user license agreement shown in Figure 2.2 by pressing the *I Accept* button.

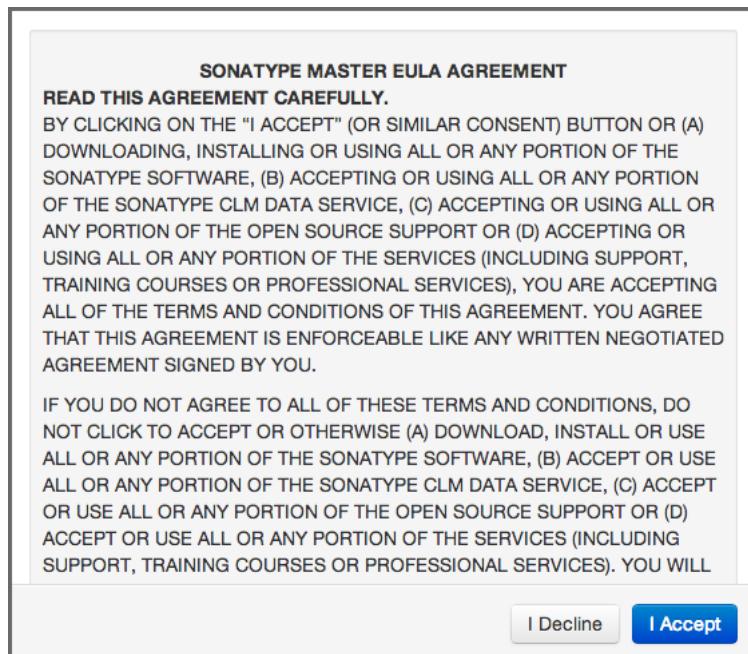


Figure 2.2: Sonatype CLM Server End User License Agreement Window

After a success message you will be redirected to the Product License page, which will now display the expiry date of the license as visible in Figure 2.3.



Figure 2.3: Installed Product License on Sonatype CLM Server

2.2.7 CLM Server Directories

When the Sonatype CLM Server first starts, it creates a directory for the storage of all its data and configuration. This directory is configured in `config.yml` and defaults to `./sonatype-work/clm-server`. This path is relative to the location from which the invoking java command is used.

Using the default startup command from the installation directory, causes `sonatype-work/clm-server` to be created within it.

If you would like to separate the installation and data directories you can set the `sonatypeWork` to a different location.

Additionally a `log` directory is created within the installation directory and the `currentLogFileName` parameter in `config.yml` can be used to change the location. Further information on logging configuration can be found in Section [2.3.7](#)

2.2.8 Running CLM Server as a Service

For production usage, we strongly recommend to set up the CLM server as a service or daemon. This will ensure that any operating system reboots will include starting up the CLM server.

A dedicated user for running a service is a well known best practice. This user should have reduced access rights as compared to the root user. Configuration of this user will depend on the operating system and security system used.

Once the user is configured, you need to ensure that full access rights to the CLM server installation directory are granted. An example command to achieve this for a service user with the username `clmserver` is:

```
chown -Rv clmserver /opt/sonatype-clm-server
```

If you have configured the `sonatypeWork` parameter in `config.yml` to point to a different directory, you have to adjust the access rights for it as well.

The principal command for starting the CLM server can be used in a simple startup script as displayed in [Startup Script](#). The `javaopts` variable should be adjusted to suit the hardware used.

Startup Script

```
#!/bin/sh
cd /opt/sonatype-clm-server
javaopts="-Xmx1024m -XX:MaxPermSize=128m"
java $javaopts -jar sonatype-clm-server-*.jar server config.yml
```

A running server can be stopped with a simple shutdown script in [Shutdown script](#).

Shutdown script

```
#!/bin/sh
pid=`ps aux | grep sonatype-clm-server | grep -v grep | awk '{print ←
$2}'`'
kill $pid
```

Typically these approaches are combined to a service script similar to the script listed in [Simplistic Service Script for Unix Systems](#). Saving this script as e.g. `sonatype-clm-server` allows you to start the server with its log running to the current shell with

```
./sonatype-clm-server console
```

Starting as a background process can be initiated with:

```
./sonatype-clm-server start
```

and a running background server can be stopped with:

```
./sonatype-clm-server stop
```

This example script can be improved to be more robust against repeat invocations, long running stops and potentially work better across different Unix flavours, but shows the principal functionality. A similar script can be used for Windows.

Simplistic Service Script for Unix Systems

```
#!/bin/sh

# The following comment lines are used by the init setup script like the
# chkconfig command for RedHat based distributions. Change as
# appropriate for your installation.
```

```
### BEGIN INIT INFO
# Provides:          clm-server
# Required-Start:    $local_fs $remote_fs $network $time $named
# Required-Stop:     $local_fs $remote_fs $network $time $named
# Default-Start:    3 5
# Default-Stop:     0 1 2 6
# Short-Description: Sonatype clm-server service
# Description:       Start the Sonatype clm-server service
### END INIT INFO

SONATYPE_CLM_SERVER_HOME=/opt/tools/sonatype-clm-server
VERSION=1.12.0
JAVA_OPTIONS="-Xmx1024m -XX:MaxPermSize=128m"
# The user ID which should be used to run the CLM server
# # IMPORTANT - Make sure that the user has the required privileges to ←
#               write into the CLM work directory.
RUN_AS_USER=clm

do_start()
{
    cd $SONATYPE_CLM_SERVER_HOME
    su -m $RUN_AS_USER -c "java -jar $JAVA_OPTIONS sonatype-clm-server-←
        $VERSION.jar server config.yml > /dev/null 2>&1 &"←
    echo "Started Sonatype CLM Server"
}

do_console()
{
    cd $SONATYPE_CLM_SERVER_HOME
    java -jar $JAVA_OPTIONS sonatype-clm-server-$VERSION.jar server config ←
        .yml
}

do_stop()
{
    pid=`ps aux | grep sonatype-clm-server | grep -v grep | awk '{print $2 ←
        }'`←
    kill $pid
    echo "Killed Sonatype CLM Server - PID $pid"
}

do_usage()
{
    echo "Usage: clm [console|start|stop]"
}

case $1 in
    console) do_console
    ;;
    ;;
```

```
start) do_start
;;
stop) do_stop
;;
*) do_usage
;;
esac
```

Setting up this script as a startup script will vary between operating systems and distributions depending on the init system used. Generally the script would be copied to a dedicated startup directory and assigned with run-levels and other characteristics for the start up. As an example on a Debian based systems the following commands could be used:

```
sudo su
cp sonatype-clm-server /etc/init.d/
cd /etc/init.d
update-rc.d sonatype-clm-server defaults
service sonatype-clm-server start
```

Depending on the requirements from your system administrator the scripts will have to be modified to fit into your environment and exact deployment scenario.

Tip

Our support team can assist you with operating system and Linux distribution-specific tips and tricks regarding the startup script and installation.

2.2.9 Backup

We **highly recommend** that you establish a data recovery plan in accordance with your company's policies.

The Sonatype CLM Server keeps all its configuration and data, besides the startup configuration, in the `sonatypeWork` folder as configured in `config.yml`. By default, this folder will be the `sonatype-work/clm-server` folder in your installation directory.

There is a tight coupling between report data stored in the file system and the data stored in the H2 database. Any backup strategy for `sonatypeWork` while the CLM Server is still available to users runs

the risk that the database will still be open, leading to a corrupt backup. Therefore, the CLM Server should be shut down before performing the backup.

2.2.10 Upgrading

Before upgrading we highly recommend you review our [more detailed guide on Upgrading Sonatype CLM](#). However, in most situations, the following steps represent a complete upgrade.

1. Find your upgrade path
2. Stop the Sonatype CLM Server
3. Perform a backup
4. Make a copy of sonatype-clm-server/config.yml
5. Copy the new installation bundle into installation folder
6. Extract the bundle
7. Apply all modifications from the backup config.yml to the new config.yml file including e.g. server ports
8. Update any startup scripts as needed
9. Start the Sonatype CLM Server

2.3 Configuration

The main configuration file for the CLM server installation is a YML formatted file called *config.yml* found in the installation directory. CLM server is an application running on a [Dropwizard](#) server.

In addition a number of configuration steps can be taken within the running server user interface.

This section will discuss various configuration options in the config file as well as some other configuration scenarios. When editing the file it is important to preserve the indentations, since they are significant for the resulting values created when parsing the configuration file. Generic configuration information can be found in the [Dropwizard User Manual](#).

Tip

The `config.yml` format does not support tab characters. Use an editor that displays special characters like tabs when editing the file.

2.3.1 Initial Configuration of CLM Server

Beside the license installation mentioned earlier, there are a few further configuration steps you should consider before diving right into using the CLM server. You can configure various aspects in the CLM *System Preferences* section of the CLM server user interface, which you can access by clicking on the



System Preferences icon located in the top right of the CLM Header/Screen (resembles a cog/gear) and choose the desired option to configure:

- Configure *Users* and *Global Roles* in the *Security* section of the left-hand navigation menu, potentially combined with *LDAP* configuration available in the *Configuration* section. Read more about the security setup outlined in the security documentation.
- Configure *Proprietary Packages* so that the CLM server can distinguish your own code from other unknown components. Refer to the component match and identification documentation in the report user guide for more information.
- Inspect or update or configure your *Product License*

2.3.2 Running the CLM Server Behind a HTTP Proxy Server

Many organizations filter, control and optimize access to the internet via a proxy server. Any server or even any computer within the organization is forced to connect to the internet via the proxy server. The Sonatype CLM Server needs to communicate with the Sonatype CLM backend services hosted on the internet.

To allow the CLM server to connect via a proxy, you have to specify the connection details in the `proxy` section of the `config.yml` file displayed in [Proxy Configuration in config.yml](#).

Proxy Configuration in config.yml

```
proxy:  
  hostname: "127.0.0.1"
```

```
port: 80
username: "anonymous"
password: "guest"
```

If your proxy server is based on whitelisted URLs, you can use the following list of URLs to ensure that the CLM server can reach all the required services.

- <https://clm.sonatype.com>
- <http://cdn.sonatype.com/>

2.3.3 Setting the Base URL

If your CLM server is accessed via a https proxy or a proxy server that changes the http port or for other reasons can potentially not determine what the authoritative URL to access the server itself is, you need to configure the `baseUrl` parameter.

```
baseUrl: http://clm-server.example.com/
```

It is used by the server for any user facing links e.g. located in email notifications sent by the server to direct users to the server.

2.3.4 Appending a User Agent String

To address the firewall configurations set by some organizations, Sonatype CLM allows you to customize the user agent header used for HTTP requests. To add a user agent string to Sonatype CLM add the following line to your `config.yml`:

```
userAgentSuffix: "test string"
```

Note

Control characters are not permitted, and the max length of the string is 128 characters.

2.3.5 File Configuration

Sonatype CLM Server stores various files and data related to its operations in a work directory. By default this data is stored in a `sonatype-work/clm-server/` directory in the path the server runs. The directory is configurable using the `sonatypeWork` field in [File Configuration in config.yml](#).

File Configuration in config.yml

```
sonatypeWork: ./sonatype-work/clm-server
```

In addition, Sonatype CLM Server uses the system temporary directory during its operation. This folder varies by operating system but is usually controlled by an environmental variable. If a specific directory needs to be used, the CLM Server can be started with a command line flag as such:

```
cd /opt/sonatype-clm-server  
java -jar -Djava.io.tmpdir=/path/to/tmpdir sonatype-clm-server-*.jar ←  
server config.yml
```

Note that the user account which the server runs under must have sufficient access rights to both the work and temporary directory in order for Sonatype CLM Server to function properly.

2.3.6 Email Configuration

The Sonatype CLM Server can be configured to send email notifications for events such as policy violation notifications. This functionality requires an SMTP server, which is configured along with a number of other options in the `mail` section of the `config.yml` file displayed in [Mail Configuration in config.yml](#).

Mail Configuration in config.yml

Here's an example configuration:

```
mail:  
  hostname: your.mailserver.com  
  port: 465  
  username: user@company.com  
  password: password  
  tls: true  
  ssl: true  
  systemEmail: "SonatypeCLM@localhost"
```

The connection details are established with `hostname` and `port` and optionally with the addition of `username`, `password`, `tls` and `ssl`. The `systemEmail` parameter will be used as the sender email for any emails the CLM server sends. **All fields are required.**

Finally, when setting email configuration, make sure you have also set the [Base URL](#), otherwise sending of notification emails may fail.

2.3.7 Logging Configuration

The CLM server application logging can be configured in the `logging` section of the `config.yml` file. By default a log directory is created in the installation directory and the `clm-server.log` is rotated. Further logging configuration is documented in the [Dropwizard manual](#).

2.3.8 HTTP Configuration

The HTTP configuration in `config.yml` is displayed in [HTTP Configuration in config.yml](#). The `port` parameter for the CLM server allows you to set the port at which the application is available. The `adminPort` exposes the operational menu. Both ports can be freely changed to other values, as long as these port numbers are not used and in the allowed range of values greater than 1024.

HTTP Configuration in config.yml

```
http:  
  port: 8070  
  adminport: 8071
```

2.3.9 HTTPS/SSL

One option to expose the CLM server via https, is to use an external server like [Apache httpd](#) or [nginx](#) and configure it for reverse proxying the external connections via https to internal http connection. This reverse proxy can be installed on the same server as the Sonatype CLM server or a different server and numerous tutorials for this setup are available on the internet.

A second option is to directly configure SSL support for Dropwizard by modifying the `http:` segment in the `config.yml` file following the example in [HTTPS Configuration in config.yml](#).

HTTPS Configuration in config.yml

```
http:  
  port: 8443  
  adminport: 8471  
  
  connectorType: nonblocking+ssl  
  
ssl:  
  keyStore: /path/to/your/keystore/file  
  keyStorePassword: yourpassword
```

The keystore file can be generated and managed with the `keytool`. Further documentation is available in the [Dropwizard documentation](#) and the [documentation for keytool](#).

2.3.10 Anonymous Access

By default the Sonatype CLM Server allows anonymous access when submitting applications for evaluation. If you would like to require users to authenticate their access with a username and password in all situations, add the following line to the config.yml:

```
anonymousClientAccessAllowed: false
```

2.4 User Management

The Sonatype CLM Server requires a username and password before any policies or policy elements can be created, viewed, and edited. When a user is created specific to Sonatype CLM, we consider this user to be part of the *Sonatype Realm*. This is also considered independent of other connected realms such as [LDAP](#).

While Sonatype does suggest using a security protocol such as LDAP for managing users and permissions, the *Sonatype Realm* is still available for those who would like a lighter setup, where all users, groups and rights are stored directly in the Sonatype CLM server.. The function of user management in the Sonatype Realm focuses on managing all the elements of a user account. In this section we will cover:

- Logging In and Logging Out

- Managing the Admin Password / Account
- Viewing Notifications
- Creating, Editing and Deleting Users
 - First and Last Names
 - E-mail Addresses
- Changing Passwords

2.4.1 Logging in to Sonatype CLM

Any user that wants to access Sonatype CLM will need a username and a password. To perform the functions described throughout this section, you will need to use a user account with administrative rights. By default the Sonatype CLM server has a preconfigured account

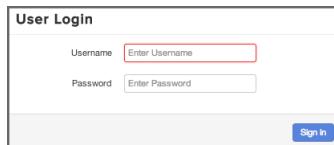


Figure 2.4: Login

Once you log in for the first time, be sure to [change the admin password](#).

To logout, click on the *Log Out* link located in the upper right corner.

Note

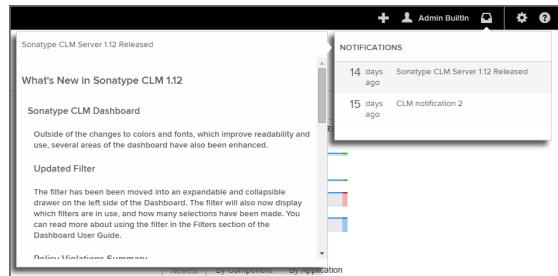
The server will timeout after 30 minutes of inactivity.

2.4.2 Viewing Notifications

Notifications provide a way for Sonatype to distribute important information about Sonatype CLM.

Unread notifications are indicated by a count, in blue, displayed over the notification icon . This icon is located in the Sonatype CLM header, next to the display of the logged-in user.

To view notifications, click on the notifications icon. This will open the Notification Panel, allowing you to click on any available notifications.



2.4.3 Changing the Admin Password

Sonatype CLM ships with a default admin account with a username `admin` and a password `admin123`. If you do nothing else related to security in Sonatype CLM, be sure to change this password. We'll cover this in Section [2.4.5](#) section below in more details, while we detail the process to change this default password now.

1. Log into the Sonatype CLM Server using a user with administrative permissions.
2. In the top right-click on the button with your username to the left of the *System Preferences* gear-shaped, icon. For the default administrator the user name will show `Admin_Builtin`.
3. A list of options will be displayed, click *Change Password*.
4. Enter the current password (`admin123` for the default admin user), the new password, and then confirm the new password.
5. Click the *Change* button to save the new password.

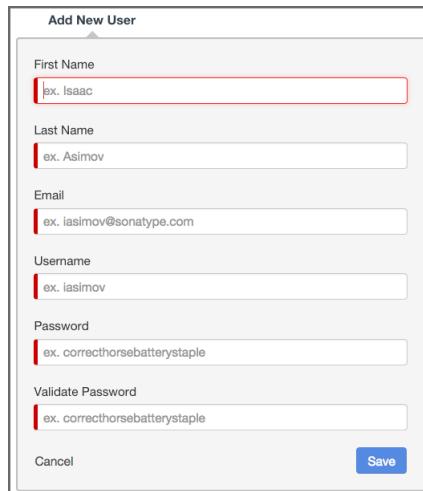
Note

Any user, including an admin, can change their password following the instructions above. However, only an admin can reset a user's password (discussed later in this Guide) without knowledge of the current password.

2.4.4 Creating a User

To create a new user in the Sonatype realm, follow the instructions below.

1. Log into the Sonatype CLM Server using a user with administrative permissions.
2. Click the *System Preferences* icon  located in the top right of the header.
3. Choose *Users* from the drop down menu. The **Users** administration area will now be displayed.
4. Click the *New User* button located at the top of the list of users.
5. The **Add New User** form will now be displayed. Enter the following information:
 - a. First Name
 - b. Last Name
 - c. E-mail Address
 - d. Username
 - e. Password
 - f. Password Validation
6. Click the *Save* button, to save the new user.



The screenshot shows the 'Add New User' dialog box. It has a title bar 'Add New User'. Below it are six input fields with placeholder text: 'First Name' (placeholder: ex. Isaac), 'Last Name' (placeholder: ex. Asimov), 'Email' (placeholder: ex. iasimov@sonatype.com), 'Username' (placeholder: ex. iasimov), 'Password' (placeholder: ex. correcthorsebatterystaple), and 'Validate Password' (placeholder: ex. correcthorsebatterystaple). At the bottom left is a 'Cancel' button, and at the bottom right is a blue 'Save' button.

Figure 2.5: Create User

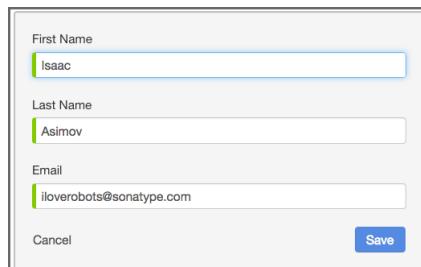
2.4.5 Editing and Deleting User Information

Editing user information is only available to an admin. The information that can be edited includes the first name, last name, email address, and password. To edit an existing user, follow these steps:

1. Log into the Sonatype CLM Server using a user with administrative permissions.
2. Click the *System Preferences* icon  located in the top right of the CLM header.
3. Choose *Users* from the drop down menu. The **Users** administration area will now be displayed.
4. At least one user - the initial `admin` account - will be displayed. If you hover your pointer over the user record you will notice that there are three icons on the right.
 - a. The icon shaped like a pencil will allow you to edit user information (i.e. first name, last name, and e-mail address).
 - b. The icon shaped like a bag with an arrow back is for resetting a user's password. If you use this option a random, secure password will be generated and displayed in a dialog. Click the icon to the right of the field to copy it to clipboard.
 - c. The icon shaped like a trashcan will allow you to delete the user after you confirm the deletion in a dialog.
5. Make any desired changes, and unless you chose to delete the record, click the *Save* button.

Tip

With regard to changing a user's password, a user can always change their own password. However, this requires knowledge of the existing password. If you encounter a user that has forgotten their password, you can reset it for them.



The screenshot shows a modal dialog box titled "Edit User". It contains three input fields: "First Name" with the value "Isaac", "Last Name" with the value "Asimov", and "Email" with the value "iloverobots@sonatype.com". At the bottom left is a "Cancel" button, and at the bottom right is a blue "Save" button.

Figure 2.6: Edit User

2.5 LDAP Integration

Light Weight Directory Protocol, also known more commonly as LDAP, provides both a protocol and a directory for storing user information. In some ways LDAP has become a ubiquitous part of most organizations' efforts to create a single sign on environment, as well as streamline user management for various applications. While we will cover some LDAP basics, the information provided here is limited and should not be considered a full reference.

Sonatype CLM supports a single LDAP realm, which simply means we support connection to a single LDAP server. This connection is configured via the Sonatype CLM Server. There are essentially two parts to integrating Sonatype CLM with LDAP:

- Configure the LDAP Server Connection
- Map LDAP User and Group Elements to Sonatype CLM

Our setup instructions provide an example using the Active directory format, and represent only the most basic approach. What we provide in this guide assumes a simple authentication method for LDAP. However, on a standard installation of Sonatype CLM, you would likely not want to use Simple Authentication as it sends the password in clear text over the network. Additionally, we have indicated a search base which corresponds to our organization's top-level domain components "dc=sonatype,dc=com". The structure can vary greatly based on your own LDAP server configuration.

Note

Once the LDAP server is configured and user attributes have been mapped, both LDAP users and users created in the Sonatype CLM Realm will be able to login into Sonatype CLM.

2.5.1 Configuring the LDAP Server Connection

The first step to establish the LDAP connection is to configure Sonatype CLM to point to your LDAP server. Those instructions are pretty straightforward as long as you have the necessary information. For this example, let's assume we have been provided the following information:

Server Name	Test LDAP Server
Protocol	LDAP
Hostname	wind-son04

Port	389
Search Base	dc=sonatype,dc=com
Authentication Type	Simple
Username	testuser
Password	tester

Note

The information provided will not allow you to access an LDAP server, and is provided just for demonstration purposes. In addition, this is only a representation of a simple connection. For an explanation of all available parameters, please see the next section.

Now, access the Sonatype CLM Server:

1. Log into the Sonatype CLM Server (*by default this is available at <http://localhost:8070>*) using a user account with Admin-level permissions (a member of the Admin Group).
2. Click the system preferences icon  located in the top right of the CLM Header/Screen (resembles a cog/gear).
3. Choose LDAP from the available option. The *LDAP Administration* area will be displayed.
4. Enter the various parameters, and then use the **Test Connection** button to ensure a connection can be made to the configured LDAP Server.
5. Click the **Save** button when finished.

Using the information from the table above, our configuration should look something like this:

The screenshot shows a configuration dialog box titled "LDAP Server". It has two tabs at the top: "CONNECTION" (selected) and "USER & GROUP SETTINGS". The "CONNECTION" tab contains several sections: "Connection Details" (Protocol: LDAP, Hostname: i-robot-01, Port: 389, Search Base: dc=win,dc=steelcaves,dc=local), "Authentication" (Method: SIMPLE, SASL Realm: empty), "Timeouts" (Connection: 30, Retry Delay: 300). At the bottom are "Cancel", "Test Connection" (highlighted in green), and "Save" buttons.

Figure 2.7: Sample LDAP Server Configuration

Note

If at any point you wish to reset the form, click the reset button and any value that have been entered will be removed.

2.5.2 LDAP Configuration Parameters

As mentioned, the example above is a basic setup. Given this, there are a number of parameters not utilized. This section provides descriptions for all available parameters that can be configured in the

Connection section of the LDAP Configuration area on the Sonatype CLM Server. When applicable, required fields have been noted.

General

Protocol

Valid values in this drop-down are LDAP and LDAPS, which correspond to the Lightweight Directory Access Protocol and the Lightweight Directory Access Protocol over SSL.

Hostname

The hostname or IP address of the LDAP.

Port

The port on which the LDAP server is listening. Port 389 is the default port for the LDAP protocol and port 636 is the default port for the LDAPS.

Search Base

The search base is the Distinguished Name (DN) to be appended to the LDAP query. The search base usually corresponds to the domain name of an organization. For example, the search base on the Sonatype LDAP server could be "dc=sonatype,dc=com".

Authentication

Method

Sonatype CLM provides four distinct authentication methods to be used when connecting to the LDAP Server:

- Simple Authentication - Simple authentication is not recommended for production deployments not using the secure LDAPS protocol as it sends a clear-text password over the network.
- Anonymous Authentication - Used when Sonatype CLM only needs read-only access to non-protected entries and attributes when binding to the LDAP.
- Digest-MD5 - This is an improvement on the CRAM-MD5 authentication method. For more information, see <http://www.ietf.org/rfc/rfc2831.txt>.
- CRAM-MD5 - The Challenge-Response Authentication Method (CRAM) based on the HMAC-MD5 MAC algorithm. In this authentication method, the server sends a challenge string to the client, the client responds with a username followed by a Hex digest which the server compares to an expected value. For more information, see RFC 2195. For a full discussion of LDAP authentication approaches, see <http://www.ietf.org/rfc/rfc2829.txt> and <http://www.ietf.org/rfc/rfc2251.txt>.

SASL Realm

The Simple Authentication and Security Layer (SASL) Realm to connect with. The SASL Realm is only available if the authentication method is Digest-MD5.

Username

Username of an LDAP User to connect (or bind) with. This is a Distinguished Name of a user who has read access to all users and groups.

Password

Password for an Administrative LDAP User.

Timeouts**Connection**

The number of seconds Sonatype CLM should try and connect to the configured server before returning an error.

Retry Delay

The number of seconds Sonatype CLM should wait before attempting to connect to the configured server again (after an error).

2.5.3 Mapping LDAP Users to Sonatype CLM

Once the LDAP Server has been configured, you can map information attributes of an LDAP user to match those of Sonatype CLM. Similar to configuring the LDAP Server, this will require that you have information related to the location of various user attributes. Here is a sample set of data, that you would likely see:

Base DN	cn=users
Object Class	user
Username Attribute	sAMAccountName
Real Name Attribute	cn
Email Attribute	mail

Once you have gathered this information, access the Sonatype CLM Server LDAP Configuration:

1. Log into the Sonatype CLM Server (*by default this is available at <http://localhost:8070>*) using a user account with Admin-level permissions (a member of the Admin Group).
2. Click the system preferences icon  located in the top right of the CLM Header/Screen (resembles a cog/gear).
3. Choose LDAP from the available option. The *LDAP Administration* area will be displayed.
4. Click on the Second Tab, just below the Server Name, *User and Group Settings*.
5. Enter the various settings, using the Test Mapping button to ensure the correct information has been mapped.
6. Click the **Save** button when finished.

Note

If at any point you wish to reset the form, click the reset button; Any values that have been entered will be removed.

Using the information from the table above, our configuration would look like this:

The screenshot shows a configuration dialog titled "LDAP Server". At the top, there are two tabs: "CONNECTION" and "USER & GROUP SETTINGS", with "USER & GROUP SETTINGS" being the active tab. Below the tabs, the "User Element Mapping" section is visible. It contains several input fields:

- "Base DN": cn=users
- "User Subtree": (checkbox is unchecked)
- "Object Class": user
- "User Filter": (empty field)
- "Username Attribute": sAMAccountName
- "Real Name Attribute": displayName
- "E-mail Attribute": mail
- "Password Attribute": (empty field)

Below these fields is the "Group Element Mapping" section, which includes a "Group Type" dropdown set to "NONE". At the bottom of the dialog are three buttons: "Cancel", "Check User Mapping" (highlighted in green), "Check Login" (highlighted in green), and "Save".

Figure 2.8: User Mapping

2.5.4 LDAP User Parameters

As mentioned, the example above is a basic setup. Specifically, we do not turn on the User Subtree option or utilize the User Filter. Descriptions for those fields, as well as all available parameters for mapping LDAP User Attributes to Sonatype CLM have been provided below. When applicable, required fields

have been noted.

Base DN (*required*)

Corresponds to the Base DN (Distinguished Name) containing user entries. This DN is going to be relative to the Search Base. For example, if your users are all contained in "cn=users,dc=sonatype,dc=com" and you specified a Search Base of "dc=sonatype,dc=com" you would use a value of "cn=users"

User Subtree

Enable this parameter if there is a tree below the Base DN which can contain user entries. For example, if all users are in "cn=users" this field should not be toggled. However, if users can appear in organizational units below "cn=users", such as "ou=development,cn=users,dc=sonatype,dc=com" this field should be toggled

Object Class (*required*)

The object class defines what attributes are expected for a given object. What is entered here must be the object class for the Username Attribute, Real Name Attribute, Email Attribute, and the Password Attribute.

User Filter

The user filter allows you to isolate a specific set of users under the Base DN.

Username Attribute (*required*)

This is the attribute of the Object class which supplies the username.

Real Name Attribute (*required*)

This is the attribute of the Object class which supplies the real name of the user.

E-Mail Attribute (*required*)

This is the attribute of the Object class which supplies the email address of the user.

Password Attribute

This is the attribute of the Object class which supplies the User Password. By default it is not toggled, which means authentication will occur as a bind to the LDAP server. Otherwise this is the attribute of the Object class which supplies the password of the user.

2.5.5 Mapping LDAP Groups to Sonatype CLM

In most LDAP implementations users are collected into various groups. This allows for better organization of a larger numbers of users, as well as provides a mechanism to isolate particular groups for specific permissions and integration into other systems such as Sonatype CLM. If LDAP groups are not mapped, Sonatype CLM will pull in all users from the Base DN. This isn't so much an issue for a small number of users. However, for larger ones it may be a concern and might grant unintended access.

As we've done with the other configuration areas, let's look at a sample set of data. In example below we'll be configuring a static LDAP group.

Group Type	Static
Base DN	ou=groups
Object Class	group
Group ID Attribute	sAMAccountName
Group Member Attribute	member
Group Member Format	

Once you have gathered this information, access the Sonatype CLM Server LDAP Configuration:

1. Log into the Sonatype CLM Server (*by default this is available at <http://localhost:8070>*) using a user account with Admin-level permissions (a member of the Admin Group).
2. Click the system preferences icon  located in the top right of the CLM Header/Screen (resembles a cog/gear).
3. Choose LDAP from the available option. The *LDAP Administration* area will be displayed.
4. Click on the Second Tab, just below the Server Name, *User and Group Settings*.
5. Just below the User Element mapping, you will see Group Element Mapping. The Group Type field will be set to *none*. Change this to *static* or *dynamic* based on the parameter descriptions below.
6. Enter the various settings.
7. Click the **Save** button when finished.

Note

If at any point you wish to reset the form, click the reset button; Any values that have been entered will be removed.

Using the information from the table above our configuration would look like this:

The screenshot shows a configuration dialog titled "Group Element Mapping". It has the following fields:

- Group Type:** STATIC (selected from a dropdown menu)
- Base DN:** cn= builtin
- Group Subtree:** (checkbox is checked)
- Object Class:** group
- Group ID Attribute:** sAMAccountName
- Group Member Attribute:** member
- Group Member Format:** \${dn}

At the bottom are three buttons: Cancel, Check User Mapping (green), Check Login (green), and Save (blue).

Figure 2.9: Group Mapping

2.5.6 LDAP Group Parameters

Groups are generally one of two types in LDAP systems - static or dynamic. A static group contains a list of users. A dynamic group is where the user contains a list of groups the user belongs to. In LDAP a static group would be captured in an entry with an Object class groupOfUniqueNames which contains one or more uniqueMember attributes. In a dynamic group configuration, each user entry in LDAP contains an attribute which lists group membership. This means the available parameters will be different based on whether you've chosen static or dynamic.

Tip

Static groups are preferred over dynamic ones, and will generally perform better if you have a large number of LDAP users.

2.5.6.1 Static Groups

Static groups are configured with the following parameters:

Base DN (*required*)

This field is similar to the Base DN field described for User Element Mapping. If your groups were defined under "ou=groups,dc=sonatype,dc=com", this field would have a value of "ou=groups"

Group Subtree

This field is similar to the User Subtree field described for User Element Mapping. If all groups are defined under the entry defined in Base DN, this field should not be selected. If a group can be defined in a tree of organizational units under the Base DN, this field should be selected.

Object Class (*required*)

This is a standard object class defined as a collection of references to unique entries in an LDAP directory, and can be used to associate user entries with a group.

Group ID Attribute (*required*)

This field specifies the attribute of the Object class that defines the Group ID.

Group Member Attribute (*required*)

This field specifies the attribute of the Object class that defines a member of a group.

Group Member Format (*required*)

This field captures the format of the Group Member Attribute, and it is used by Sonatype CLM to extract a username from this attribute. For example, if the Group Member Attribute has the format uid=brian,ou=users,dc=sonatype,dc=com, then the Group Member Format would be uid=\${username},ou=users,dc=sonatype,dc=com. If the Group Member Attribute had the format "brian", then the Group Member Format would be \${username}.

2.5.6.2 Dynamic Groups

If your installation does not use Static Groups, you can configure Sonatype CLM LDAP integration to refer to an attribute on the User entry to derive group membership. To do this, select Dynamic Groups in the Group Type field in Group Element Mapping.

Dynamic groups are configured via the Member of Attribute parameter. Sonatype CLM will inspect this attribute of the user entry to get a list of groups that the user is a member of. In this configuration, a user entry would have an attribute such as *memberOf* which would contain the name of a group.

The screenshot shows a configuration interface for a dynamic group. At the top, there's a field labeled 'Password Attribute' with a dropdown menu. Below it is a section titled 'Group Element Mapping' with a 'Group Type' dropdown set to 'DYNAMIC'. Underneath is a 'Member of Attribute' field containing 'memberOf'. A checkbox labeled 'Included in Search' is checked. At the bottom are three buttons: 'Cancel', 'Check User Mapping' (green), 'Check Login' (green), and 'Save' (blue).

Figure 2.10: Dynamic Group Options

Tip

Depending on the size of your enterprise, LDAP search could be slow. If you find this is the case, uncheck the option to "Include in Search". This will **exclude groups from search results** when mapping users to roles. Searching for users will remain unaffected.

2.5.7 Verifying LDAP Configuration

It's easy to make a typo, or even have entered the wrong information when mapping LDAP users or groups. There are a number of tools provided within the LDAP configuration area to assist in making sure everything has been mapped correctly. Each of these is discussed below.

2.5.7.1 Test Connection

Testing the LDAP connection is the first step. If you can't connect to your LDAP server, user and group mapping will fail as well.



Figure 2.11: Testing LDAP Server

2.5.7.2 Check User and Group Mapping

Making sure that usernames, real names, email addresses, and groups have been mapped correctly can be verified with the Check User Mapping.

Verify LDAP Field Mappings			
Username	Name	E-mail	Groups
Administrator			Administrators
Guest			Guests
jyoung	Justin		Administrators, Users
CLM	CLM		Administrators, Users
krbtgt			
admin	admin		
testuser1	John Smith Jr.	testuser1@win.blackforest.local	Users
bmayhew	bmayhew		Administrators

Figure 2.12: Checking User Mapping

2.5.7.3 Check Login

As a final test to ensure users can log in, the Check Login allows you to enter a user name and password, and ensure ensure that this can be authenticated with the LDAP server.

Test LDAP Login Credentials	
Username	<input type="text" value="testuser1"/>
Password	<input type="password" value="*****"/>
Success! ×	
Close	<input type="button" value="Test Login"/>

Figure 2.13: Checking User Login

2.6 Role Management (Permissions) Overview

Roles control the permissions for use within the CLM Server as well as the connected suite of tools. When users are mapped to a role they are granted a set of permissions associated with that role. This section describes the available roles, as well as how to map users to those roles.

2.6.1 Role Definitions

Administrator

The Administrator role is considered a global role, and is managed via system preferences figs/web/clm-server-system-preferences-icon.png.. It has the full permissions to view, create, and modify any element of the Sonatype CLM Server. This extends to interaction with the entire suite of Sonatype CLM tools, and includes permission to evaluate applications or components and review the results.



Warning

Due to the unrestricted access of the Administrator role, [changing the password](#) from the provided default is highly recommended.

Owner

The Owner role provides full permissions for the user mapped to the Organization or Application. This includes viewing, creating, and modifying any element within the scope of the respective organization/application. It also includes permission to evaluate applications or components and review the results.

Developer

The Developer role provides view permissions for the user mapped to the Organization or Application. It also includes permission to evaluate components and review the results.

Application Evaluator

The Application Evaluator role provides permission to submit applications for evaluation and retrieve summary-level results for the user mapped to the Organization or Application. This role is useful for tools such as continuous integration (e.g. [CLM for Bamboo](#) or [CLM for Hudson/Jenkins](#)) and command line evaluation (e.g. [CLM for CLI](#)). This role can also be used to configure these tools and allows these tools to display a summary of the policy evaluation.

Component Evaluator

The Component Evaluator role provides permission to submit components for evaluation and retrieve summary-level results for the user mapped to the Organization or Application. This role is useful for tools such as an IDE (e.g. [CLM for IDE](#)) and Nexus (e.g. [CLM for Nexus](#)) which retrieve

policy evaluation at the component level. While this role can retrieve evaluation results, it cannot override any component data nor apply component labels.

Note

For all roles except the Administrator role, when a user is mapped to a role for an Organization, the user will have the same permissions associated with that role for any attached Applications.

2.6.2 Mapping Roles

To map a user (or group if you have configured LDAP) to a role, follow the instructions below:

1. Log in to the Sonatype CLM Server with a user mapped to either the Administrator role, or the Owner role (for an Organization and/or Application).

Note

When mapping users with the Owner role, you will only be able to map users to the Organization and/or Application you are an owner for.

2. Navigate to an Organization or Application, click on the Security tab, and then click the *Edit* icon (it resembles a pencil).
3. A search widget will be displayed. In the search field, enter as much of the user's complete name as possible, followed by a trailing wildcard (e.g. Isaac A*), and then click the *Search* button.

Note

Practice caution as use of leading wildcards can greatly impact user search times.

4. Once you see the user you wish to add in the Available column, click the *Plus* icon to move them to the Applied column. To remove users from a role, follow the same process above, just click the *Minus* icon to move the user from the Applied column to the Available column. Click the *Save* button to save your changes.

Tip

You may notice that below each user, there is additional information. Most often this is the email. However, to the right of the email you will see the Realm (e.g. LDAP). Use this to ensure you add the appropriate account.

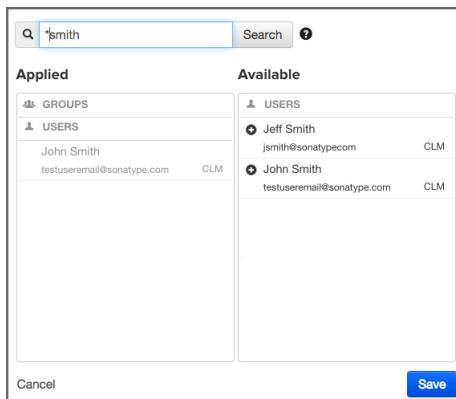


Figure 2.14: Mapping Users to roles

2.6.3 Excluding Groups from Search Results

Mapping a group to a role utilizes elements that are configured via the [LDAP System Preferences area](#). If you go with the default options, groups will be included with the search results. That is, when you enter something into the *Find User* field, both groups and single users will be returned.

However, because the size of LDAP implementation can vary, you may want to consider not including groups with your search results. This option can be adjusted when using [Dynamic Groups settings](#).

Making this change will then allow you to manually enter group names. However, when entering groups this way, no search or validation will be performed.

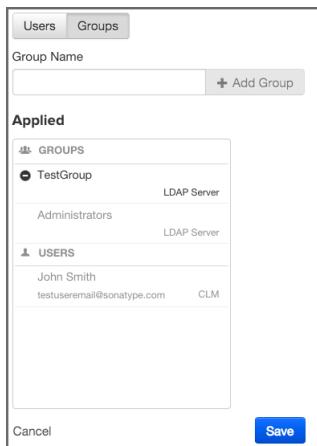


Figure 2.15: Mapping Groups When Not Included With Search

2.7 Conclusion

While some parts of this chapter were designed to be followed step by step, you will find that a lot of the information here will be needed as you begin to implement Sonatype CLM more widely. Don't worry if you find yourself coming back to better understand users and roles, or even how to setup your LDAP connection.

That said, you should accomplish a few key items including:

- Download and install the Sonatype CLM server.
- Make any necessary configuration changes.
- Modify the Admin account to protect access.

If you've complete these things, you are ready to head onto the next step, Chapter 3.

Note

If you have purchased the Sonatype CLM add-ons for [Eclipse](#), [Hudson/Jenkins](#), or [Nexus](#), this information is provided in the specific chapters. Clicking on these links will take you to those areas directly.

Chapter 3

Sonatype CLM Policy Management

3.1 Introduction

As we've mentioned, Sonatype CLM is a powerful system for improving how your teams consume open source components. For the first time, you have the ability to take pen and paper rules, and turn them into enforceable policies for component usage within your enterprise. Better yet, all of this can be done simply and easily, with results that provide a detailed analysis of the health of your applications. And this happens not in days or months, but in most cases, just a few seconds.

While there are options for getting Sonatype CLM going right *out of the box* with our sample policies and policy elements, the road to designing and refining your own custom policies is where you want to be.

Before we get there though, we should first take a closer look, defining every part of the policies, dissecting it really, and explaining it in detail. Of course, we'll also walk you through the stages of importing policies as well.

To get started, let's see what you'll find in this guide:

- Introduction to Policy, Governance, and CLM
- Organization and Application Management
- Policy Development and Management

- Policy Element Overview and Usage
- Manual Application Scanning and Evaluation
- Basic Reporting
- Importing Policy

Remember, before you get started you need to make sure you have, at a minimum:

- Installed Sonatype CLM Server (or Nexus Pro: Sonatype CLM Edition)
- Installed your Sonatype CLM License

3.2 What is a Policy?

When we talk about policy within the paradigm of Sonatype CLM, we refer to it as a way to identify and reduce risk through a concise set of rules for component usage. These rules can be used to assist at every step of the component and development lifecycle, and can be customized for specific applications and organizations. In general, policy, within the context of Sonatype CLM, is a broad term used to encapsulate:

- Conditions
- Actions

In some ways rules as a description is a bit generic, so let's dig a bit deeper, and look at another concept you are likely familiar with, an `If/Then` statement.

3.2.1 Basic Policy Anatomy

One of the easiest way to break down the various elements of a policy, at least the most basic parts, is to think of a policy as an `If/Then` statement. That is, a policy simply says that if something happens, then perform a certain action. If a component meets a set of criteria, then take a certain action, or in some cases no action at all.

If it's still a bit fuzzy, an example will probably help. Let's say we have a known rule in our development organization that says if a component used in an application has a security vulnerability, the application can not be released. To do this, we tell our development team to review components before release and if a component has a security issue, we don't promote the release. Congratulations, you have formed, at least in the aether, your first policy.

Now, let's take a slightly closer look, and define the basic policy anatomy. There are actually three key parts to a policy:

Conditions

conditions are the `if` part of the `if-then` statements.

Constraints

a constraint is really just a way to organize multiple conditions (if-then statements). Our example only had one so far. Let's say we decided we wanted to add that if a security issue is found and it has a CVSS of 2 or lower, only a warning should occur, but the release should not be prohibited.

Actions

actions are simply the `then` part of the if-then statement. Basically, what you want to have happen.

The above does a good job of telling us what makes up a policy in Sonatype CLM, but you are likely thinking, not all policies should be the same, I need a way to demonstrate which policies are the most important. We thought that too, and that is why in Sonatype CLM, all policies are assigned a threat level ranging from zero to ten (0-10). This score is completely subjective and will be unique in your organization.

OK, so now that we've opened up our concept of policy a bit, exposing the inner workings so to speak, the next question you should have is, "Where do we create policies?"

Well, as you likely recall, we can manage policy for both organizations and applications. We've learned a bit about these already, but let's go ahead and have a quick review.

3.2.2 Organizations, Applications and Inheritance

As a quick overview, the differences between an organization and application are as follows.

Organizations

- Require a name

- Provide an option to attach an icon
- Serve as a way to group applications.

Applications

- Require a name, application ID, and an organization.
- Provide an option to attach an icon.
- Represent a one-to-one relationship (App ID) between an actual application (or project), and Sonatype CLM.

Inheritance

Now, there is one final difference between organizations and applications, and that is inheritance, which is simply the ability for elements from an organization to transfer down to an application.

Ultimately this allows you to avoid micromanagement. For example, let's say there is a policy that says no component can have a security violation score greater than 3. This rule should apply to a number of applications that are all associated to a particular organization. Thanks to inheritance I can create a policy for the organization and all applications will inherit this policy. This also means I won't need to make changes to the policy for each application, rather I only make the change once, at the organization level, and it will affect any application attached to that organization. This policy will also apply to any additional applications I create under this organization in the future.

The important thing here, is to start thinking about policy more holistically. This is even before you begin to create policy in Sonatype CLM, you should think about where your policies will be created, and what applications will share similar policies. If nothing else, start writing out policies you would like to experiment with. Communicate those to your teams and start incorporating a proper feedback loop.

3.2.3 Summary

This section was all about policy. It's primarily theory, but theory that is quite important for your practical implementation. Sonatype CLM will build on everything discussed here. As a recap, here's what you should walk away with:

- Policy is an aggregation of rules that are basically If/Then statements - your policies
- Each policy consists of one or many conditions
- Multiple conditions together form a constraint
- When all conditions are met a policy results in the execution of an action
- Applications inherit policies from the organization they are associated to

3.3 Organization and Application Management

You've likely heard that Sonatype CLM provides you with information about the components inside your applications. In addition to that information, you will see whether or not that component meets the rules for component usage that your organization has established - your policy. In order to provide that information however, there needs to be a link between your application and Sonatype CLM. But, how do we create that link, and where do we start?

Well, let's do a little introspection, and take a look at the idea of organizational structure.

3.3.1 Organizational Structure

When you launch Sonatype CLM for the first time, even after setting up and configuring your security parameters, there will be little to no information, a blank slate if you will.

Now, you could go off and simply start creating organizations and applications, as it's a fairly simple process. However, it would be wiser to think about how your particular business organizes applications. For many teams this follows a "command and control" structure, or rather one where various business units are responsible for specific applications. For others, applications create more logical categories, such as internal, or perhaps, commercial units, each having sets of applications below them.

In both cases these are units which simply contain applications, and there is some correlation between each application, even if it is only surface level. This idea of containers and correlation is the exact principle behind organizations.

Organizations, when looking simply at their most basic function, serve as a container for applications. While we cover how organizations manage policy and the other policy elements in just a moment, it's important to think about how you will set up your organizations before you begin creating them in Sonatype CLM.

Once you've done that though, you are ready to create an organization.

3.3.2 Creating an Organization

Organizations are created via the Sonatype CLM Server. Make sure you have proper access, which includes at least admin-level permissions (a member of the admin security group).

There are two main ways to create an organization:

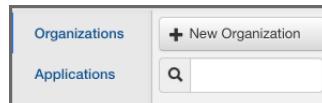


Figure 3.1: Using New Organization button



Figure 3.2: Using Global Create Button

The essential difference between the two options lies in Global Create button, which simply provides access to create an organization from anywhere within the Sonatype CLM Server.

Regardless of the option you choose, to create the organization, you only need to enter a name, and then click the *Save* button.

OPTIONAL ROBOT: As an option, you can add an icon for your organization, but this is not required. The image should be sized to 160 x 160 pixels and use the PNG format. Images with different sizes will be scaled. Alternatively you can press *Want a robot* to use a robot image. Each time you click on the link, a new robot image will appear.

3.3.3 Creating an Application

Earlier, we talked about a link between applications being developed, and the policy (or policies) that will be governing the components used in those applications. That link is provided by creating an application record within Sonatype CLM.

There are two main ways to create an application:

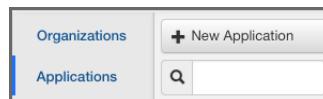


Figure 3.3: Using New Application button

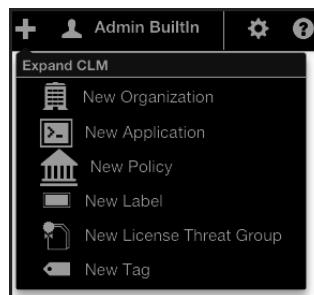


Figure 3.4: Using Global Create Button

The essential difference between the two options lies in Global Create button, which simply provides access to create an application from anywhere within the Sonatype CLM Server.

Regardless of the option you choose, the information necessary to create an application is the same. Each application has three essential parts, which have been described below. Descriptions for optional items have been included as well.

Application Name (*required*)

This can be anything you want it to be, but it should be something people recognize. For example, Employee Intranet Application for Android, or International Bank Transfer Application. It is, quite simply, just a name, and it should be one that your users can identify with easily, as this is the name they will see in the various tools that connect to Sonatype CLM.

Application ID (*required*)

An Application ID, or App ID, is a unique identifier that you define for the application. In many ways, it's like a national identifier for the application. Most users will never see the application ID. However, it is used in a number of manual locations, including the various APIs that Sonatype CLM provides.

Organization (*required*)

Applications can share the same organization, and depending on the organization that you choose this determines a number of things such as which policies the application will be evaluated against. We'll discuss this more in the next section, for now, just treat this as a logical container helping to group your applications.

Note

Once an organization has been selected for an application, it can not be changed.

Contact (*optional*)

The contact is the person that is responsible for the application, or at the very least, should be contacted if there is an issue. It will be displayed in the reporting area of Sonatype CLM, as well as the PDF version of the report.

Icon (*optional*)

You can add an icon for your application, to help make it more easily identifiable. The image should be sized to 160 x 160 pixels and use the PNG format. Images with different sizes will be scaled. Alternatively you can press *Want a robot* to use a robot image. Each time you click on the link, a new robot image will appear.

3.3.4 Organization, Application, and Inheritance

So we understand the difference between organizations and applications, but how should this affect how we manage policy?

In fact the concept of policy may still be confusing. For now though, let's just think about it as a set of rules for components you can or can't use in your applications. Given this, each application is different, why not create policy (rules) for each individual application?

This is actually a common question when it comes to creating your policies for the first time. Our inclination tends to be to match a policy to an application. That is because we can sometimes think of

applications as being very unique, and for that reason they will each have their own policies, different from other applications. This might be true. However, inheritance from an organization to an application plays a big role in making policy management much easier. Let's look at how the concept of inheritance works.

3.3.5 The Power of Inheritance

Because an organization can have multiple applications attached, and those applications inherit policies as well as labels, and license threat groups, creating a policy at the organization level allows us to manage a single policy across hundreds of applications. With this inheritance, you can make one modification and have that change affect all, or at least large numbers of, applications.

Now, lets put this in contrast with creating a policy at the application level, which seems similar, but the lack of inheritance from one application to another changes things up.

3.3.6 Avoiding Policy Micromanagement

In the case of organization level policy (rules), which appears across many different applications, the application level policy is meant for precise scenarios where the policy is only intended for a single application.

Doing this takes into account something specific we want to identify or keep out of a single application, but not others. The more of these application level policies that are created though, means the more micromanagement, and in turn, opportunity for error, will occur. So, keeping them at a minimum, and only for those unique scenarios is ideal.

This is likely better conveyed in an example. Imagine two applications with 4 policies each. Two policies for these applications are identical. If you have this setup with two separate applications, any change to the identical policies has to be done once for each application. However if we move these policies to the organization that both applications belong to, we only have to change one. Now imagine a similar scenario with a larger number of shared policies as well as applications. Without organizations to inherit from this would become unmanageable quickly.

Alright, we understand organization level policies are a good idea, and application level policies should be used as minimally as possible. This tends to create a question of, "How do I know when to create an organization vs. application policy?" In reality the first limitation will actually be related to what you have access to create and/or view.

3.3.7 Permissions and Roles

Security administration can't really begin to take place until your first organization and application are created. This will need to be done by an administrator, as demonstrated in the examples above.

Once created, each organization and application has two available roles displayed in the *Security* section of the application and organization overview.

Owner

has full access to manage policy for the assigned organization or application.

Developer

has view only access for the assigned organization or application.

Note

Assigning a person to an organization role grants the same permissions to the applications within that organization.

Once you understand permissions, you can develop policies. Communicate with others to avoid micromanagement. If you don't have access to create an organization-level policy, it doesn't mean that it wouldn't benefit to create policy for applications within that organization.

3.3.8 Summary

OK, so in total, this first concept of organization vs. application is pretty simple. However, it's important to remember what you do here is setting up how you can manage policy later. If you followed our steps you should have done at least two things in this section:

- Created an organization
- Created an application

You should also have a clear understanding about inheritance and how organizations and applications differ. Finally, when you are first starting out, it is a good idea to experiment by creating a few one-off policies at the application level. Be diligent though, when you find yourself copying constraints and

conditions into policies used by more than one application, it's likely time to consider simply adding the policy at the organization level.

3.4 Policy Development

Sonatype CLM uses the term **policy** to broadly refer to the set of policies and policy elements (e.g. labels and license threat groups) used to ensure components in an application meet a specific set of standard. In the past, we colloquially compared these to *rules*.

The process of creating this set of rules based on specific factors is considered policy development. Combining this with the ongoing refinement and adjustment is the broader category of policy management. No matter what it is called though, the end result should always be actionable results that are representative of your organizations risk tolerance. Put a bit more simply, Sonatype CLM policy provides a means to organize risk data.

Before we expand on risk, let's dig a little deeper, and really take a look at what we mean when we talk about policy, expanding everything that goes into its development.

3.4.1 Advanced Anatomy of a Policy

If you have taken a look at any of Sonatype CLM documentation or poked around the imported policies in the Sonatype CLM server user interface, you may have already seen what we refer to as basic anatomy of a policy - all the pieces that go together and define your policy.

The screenshot shows the 'Security-High' policy editing screen. At the top left is a red square icon with 'Security-High'. To its right is a dropdown menu showing '9'. On the far right are edit and delete icons.

Application Matching

Which applications should this policy apply to?

All Applications in My Organization
 Applications with one or more of these tags None selected ▾

Constraints

CVSS >=7 and <10

Security Vulnerability Severity	>=	7	-	+
Security Vulnerability Severity	<	10	-	+
Security Vulnerability Status	is not	Not Applicable	-	+

All of the above conditions will trigger this constraint.

Actions

Stage	Enforcement Points		
	Warn	Fail	Notifications
Develop			✉
Build			✉
Stage Release			✉
Release		!	✉
Operate			✉

Monitoring Notifications

If you have enabled monitoring, who should be notified?

MySecurityTeam@mycompany.com

Cancel Save

Figure 3.5: Editing a Policy and its Attributes

So, branching beyond the simple concept of If/Then statements, let's break policy down into each part you can interact with keeping an eye on the editing screen for a policy displayed in Figure 3.5.

Policy Name

This name will be displayed on the *Policy* tab in the application composition report. Others will see

this regularly, so it should be unique, clear, and concise.

Threat Level

A number, 10 - 0, that is color coded (red, orange, yellow, dark blue, and light blue), and represents the perceived severity if this policy is violated. The number will also be used to create the order in which policy violations are displayed.

Constraints

Each policy must have at least one constraint. When a constraint is fulfilled, a policy violation occurs. A constraint itself consists of the **Constraint Name** and at least one condition. Make sure it clearly identifies the conditions that you have added for the Constraint.

Conditions

A condition is considered the *if* part of an if-then statement. There are a wide range of conditions possible, that have their own set of values you can choose from.

Any/All

Any/all is required when there are multiple conditions. This tells the policy whether all of the listed conditions, or simply any of them, must be met in order to have a policy violation.

Actions

The then part of an if-then statement. The action chosen here will be taken when the policy constraint and its associated conditions have been met.

Stage

These stages represent the enforcement point. They are *Develop*, *Build*, *Stage Release*, *Release* and *Operate*.

Warn and Fail

Each enforcement point for each stage can be configured to cause a 'Warn'ing or a 'Fail'ure.

Custom

This action allows you to select an email, or emails, to send notification to when new policy violations have occurred.

Now that we understand the different attributes of an individual policy, you're likely eager to create your own policy. We'll tackle that next in Section 3.5, but first let's take a look at some important items to consider when developing our policy.

Note

When viewing policy violations counts, please keep in mind that despite the number of constraints fulfilled, only one policy violation is counted.

3.4.2 Risk and Organizational Intent

To establish an understanding of risk within the context of CLM, we need to identify the various avenues of risk a component can have. The most common are security, licensing and architectural considerations.

Of course, we shouldn't limit our thinking to these three alone, and in the long term you will define those specific to your organization. However, they will serve us well to get started.

When creating CLM policies, we need to consider what is the risk we want reported and how we want it reported. Take a look at these very simple example policies, one each for licensing, security, and architecture.

Licensing

- Don't allow distributed code to have GPL
- Only allow GPL that has a Commercial license

Security

- Don't allow components with a CVSS score > 7

Architecture

- Don't allow components that are older than 5 years
- Don't allow Struts version 2.3.15.1

The above policies represent an organizational intent to not allow GPL highly insecure components. It further qualifies that old components and a specific version of struts are not to be used. In this way, our three policies are actually working together to form an overall policy approach.

As you move on to create your own policies, it becomes very important to think about how policies can build upon each other. In many ways this is a holistic approach, something that rules simply can't do.

3.4.3 Summary

Policy development should be treated to be as important as any other aspect of Sonatype CLM. While it is more of the planning and thinking stage of policy, it can make the difference between well thought out and applicable policies and policies that require constant change, or seem to disrupt rather than compliment the development life cycle. Soon you'll be creating policies on your own. For now though, be sure you take these key items away in this section:

- Importance of Policy Development
- Risk and Organizational Intent

3.5 Policy Creation

So you are ready to create your first policy. Great! If you have reached this point, it is important to be sure you have everything in place before you begin creating your own custom policies:

- Organizations and applications are set up as desired in the Sonatype CLM server.
- Users have been assigned to these organizations and applications with the proper roles to fulfill your security requirements.
- You have determined the risks that apply to your organization and/or applications.

If you haven't done so, it's also a good idea to write out the policies you want to create. While you will find the actual creation process is pretty easy, the more thought you put into your policies and their structure the better they will be.

Also, don't forget, that once created, a policy needs to adjusted and modified over time. We refer to that more largely as Policy Management.

3.5.1 Getting Started

We've decided to break policy creation into six total steps. Each step deals with a specific area of a policy and will be described in detail. Before you go to the first step, you should know there are two key ways to create a policy.

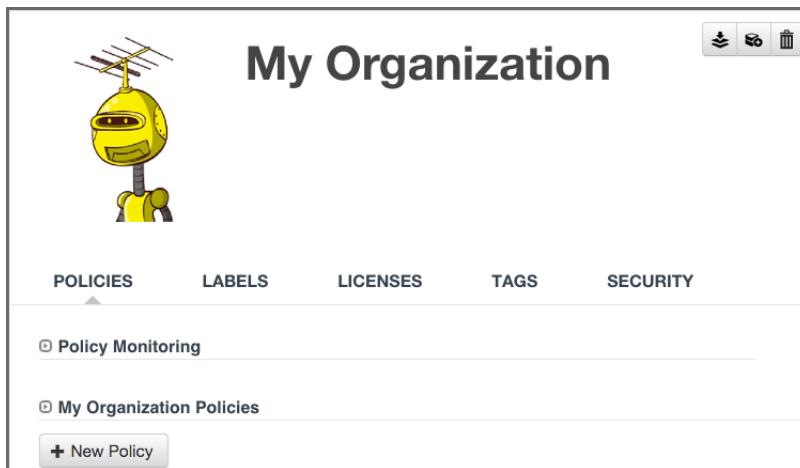


Figure 3.6: Using New Policy Button



Figure 3.7: Using Global Create Button

Note

Our instructions follow the process for creating a policy for an organization. This is where most of your policies will be created. However, if you need to create an application-specific policy, just substitute application for organization.

There is really no difference here, as both require that you have the organization or application open at the time of creation. The one advantage with using the Global Create button is that you can create no matter which tab of the currently selected organization or application you are in.

3.5.2 Step 1: Understand the Policy Intent

So, let's build on the third item we mentioned in the introduction, and first think about the intent of the policy we are going to create. Here are some questions to consider:

- Is this policy for all applications, or should it only be matched against certain ones?
- What rules do we want to create, or in other words, what things do we not want in our applications, or this specific set of applications?
- How do we want to react when violations occur?

These questions are really just the start, but in short you should ask what applications, what causes a violation, and what action should be taken. For our example policy, we want to focus on architecture aspects, with key areas being *Age* and *Popularity* of our components.

3.5.3 Step 2: Decide on a Descriptive Policy Name

Since architecture is our focus we are going to use it as part of the name for our policy. In addition we are going to add *Age* and *Popularity* to the name to be more specific. This will help us later when we start creating additional architecture related policies. Lets go ahead and create this policy:

1. Log into the Sonatype CLM Server (*by default this is available at <http://localhost:8070>*) using a user account with Owner-level permissions for the organization (a member of the Organization's Owner Group).
2. Next, click the *Organizational Design* icon  to access the **Organizational Design** area.
3. In the menu on the left, click on *Organizations*, and then click the organization you want to add a policy to.
4. To create a new policy, click the *New Policy* button. You should now see the policy editing screen (as displayed in Figure 3.8).
5. The policy name input field should have focus and contain *Enter Policy Name*.
6. Enter the new policy name by typing *Architecture Age and Popularity*

The screenshot shows a policy configuration screen. At the top left is a dropdown menu labeled "Architecture Age and Popularity" with the value "5". To its right is a small orange button with the number "5". Below this is a section titled "Application Matching" with the sub-instruction "Which applications should this policy apply to?". There are two radio buttons: "All Applications in My Organization" (selected) and "Applications with one or more of these tags". Next to the second radio button is a dropdown menu labeled "None selected".

Below this is a section titled "Constraints" containing a single item: "[Unnamed Constraint]".

Under "Actions", there is a table titled "Enforcement Points" with columns "Stage", "Warn", "Fail", and "Notifications". The rows represent the software development lifecycle stages: Develop, Build, Stage Release, Release, and Operate. Each row has a checked checkbox in the "Notifications" column.

At the bottom of the form is a section titled "Monitoring Notifications" with the instruction "If you have enabled monitoring, who should be notified?". A text input field contains the letter "x".

At the very bottom right of the form are two buttons: "Cancel" and "Save" (in a blue box).

Figure 3.8: Naming the Policy

3.5.4 Step 3: Choose an Appropriate Threat Level

Threat level is one of the easiest concepts we'll cover in this guide, yet it has the greatest chance to cause huge problems. At its core, this is simply a value for severity your business associates with a given policy. These values range from 1 to 10, each corresponding to a range of severity, and a specific color:

Table 3.1: Threat Levels

High	Red	8-10
Medium	Orange	4-7
Low	Yellow	2-3
Informational	Dark Blue	1
None	Light Blue	0

To assign threat level to a policy, you will need to be in the policy edit mode (click on the editing icon). Next, use the drop down, which is located next to policy screen. This is displayed in Figure 3.9.

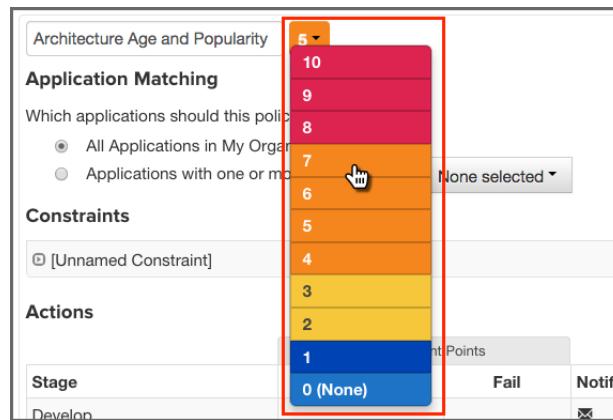


Figure 3.9: Editing the Policy Threat Level

When a threat level is selected by any component that has violated a policy will be displayed in the order of the severity of the violation. This is straight forward, but let's take a look at the details and see where some issues can arise.

Just like taste is subjective, you have to realize that severity is subjective. What may be a level 10 for one part of the business may be quite different for another.

A bigger concern is what message you want to communicate to the recipients of the analysis. For example members of your team will naturally be inclined, to treat high severity as very important, and critical. If they see too many of these, the prospect of ever making any headway could be impacted in a negative way and you might dismay e.g. your developers to even get started on trying to fix the violations since there are just too many. As with any control mechanism it is probably advisable to be a bit lenient at first and start to get stricter at a later stage, when the worst problems are dealt with. Otherwise you could cause undue stress to development and management teams. The important thing is to keep in mind is how you will assign severity, and the impact it has on those reviewing violations.

Especially in the beginning, our recommendation is to reduce, if not exclude the high severity threat levels altogether. Remember, at the core, this number is purely for ordering how a violation will be displayed to a user of Sonatype CLM. Because this needs to be interpreted, the actual value is very subjective. It's

easy to overwhelm members of your team by seeing large numbers of highly severe violations. It might even be reasonable to set severity to the lowest setting for a violation (Low - 1) in the beginning. This way, members of your teams can get used to seeing the results that are produced.

In our example policy, architecture quality is pretty important, but it's not the most important issue, so we'll leave the default threat level of 5. This will give us a violation higher up in the display, but it's certainly not the worst.

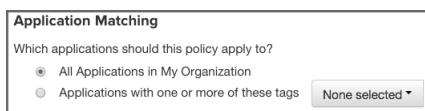
Tip

Remember, threat is subjective, and is most useful for ordering violations.

3.5.5 Step 4: Choose the Application Matching Parameters

In many cases, policies will be evaluated against all applications. However, as your applications become more diverse and there are various groups of applications with similar characteristics, you may find the need to develop policies for these specific cases. This will go hand-in-hand with the [creation of tags](#), which application owners will apply to their applications.

Given the ability to create tags, there is an endless amount of refinement that can be done in order to focus a particular policy on a set of applications with similar characteristics. While we won't get into the creation of tags here, thinking about this as a way to create more finely tuned policy is a good first step. For now, we'll assume we have some pretty generalized architecture requirements for all applications, and want to make a policy that will match all applications in this organization.



3.5.6 Step 5: Create Constraints with Conditions

By now, we should know that an easy way to look at conditions is to consider them the `if` part of an `if/then` statement. In contrast, a constraint is not part of the statement, but rather a container for conditions. This can come in real handy when you want to consolidate a policy, by grouping similar conditions.

The screenshot shows the 'Constraints' dialog box with three conditions defined:

- Old:** Age older than 5 Years.
- Unpopular:** Relative Popularity (Percentage) <= 10.
- New:** Age younger than 3 Months.

Figure 3.10: Example Constraint

But why do this?

Well, for one thing, it reduces time. Next, because constraints are displayed on the application composition report, along with violations, it becomes easier for a member of your team to process information that is similar. Of course, it also has the added benefit of not having to create hundreds of small, one-off policies.

For example, in our *Architecture Age and Quality* policy, we may start with two conditions, one for age and one for popularity. This will work, but it's likely better, especially if we want to expand that later on, we isolate these as separate constraints.

As a good practice, grouping similar conditions is the best way to build your constraints. Again, this will help de-clutter a multi-policy environment, as well as help someone reading any associated violations on the application composition report. For our example, we'll be placing both conditions in the same constraint.

1. Click on the *Expand/Collapse* icon (shaped like a right-facing triangle). It's next to the *Constraint Name* and should display *Unnamed Constraint*.
2. Once the constraint is expanded, click the *Constraint Name* field and enter *Age and Popularity* as the constraint name where the field initially displays *Enter Constraint Name*.
3. Using the drop downs and the add (+) button, add two conditions.
 - a. *Age* should be checked to be *older than* the value of 3 Years.
 - b. *Relative Popularity (Percentage)* should be set to be greater than or equal to (\geq) 50 percent (50%).

4. Select *All* in the drop down below the conditions as the aggregating rule so that all of the above conditions have to be fulfilled to trigger a policy violation for the constraint.



Figure 3.11: Adding Constraints

Now, before we move on, let's take a look at some of the specific aspects of conditions that can tend to be a bit confusing.

Policy Type Sonatype CLM has an algorithm for determining the type of policy you created. This type is based on the types of conditions you include and is mainly used in reporting purposes. For example the trending report aggregate the different policy types into separate lists. The rules to determine the type of a policy are:

- If there are any security conditions, it is considered a security type policy.
- If there are any license conditions, it is considered a license type policy.
- If there are any age or popularity conditions, it is considered a quality type policy.
- If there are any conditions not mentioned above, it is considered an other type policy.

Any vs. All If a component meets any constraint, the policy is considered violated. However, inside each constraint, when you have more than one condition, you have the ability to require that a component must either meet all conditions or just any of the conditions to trigger a violation.

This is a straightforward concept, but it can produce vastly different results. For example, selecting *Any* as an option will tend to produce a lot more violations, it's the equivalent of placing an *or* between each condition. In addition even if you resolve one violation for a component, if the component meets other conditions later on, it might cause it to still violate the policy. On the other hand, using *All* allows you to establish that all conditions must be met. It's like placing an *and* between each condition. In this case, if you address any of the conditions, the violation will be resolved.

Let's look at an example that would further explain this, and then we will move on to creating conditions in our policy. Below, we have a couple of policies and a component. If we wanted to exclude components that were younger than four years and had less than fifty percent popularity, which would we want to use? Also, would the component listed violate this policy?

Policy 1 with Conditions

- Age is < 4 years
- Relative Popularity is \leq than 50%
- **Any** of the above conditions trigger the constraint.

Policy 2 with Conditions

- Age is < 4 years
- Relative Popularity is \leq than 50%
- **All** of the above conditions trigger the constraint.

Component Data

- Age is 3 years
- Relative Popularity is 85%

It may seem like these two policies are exactly the same, but there is a key difference, Any vs. All. So, our first policy states that if *Any* of the conditions are met that a violation will occur. Given that, our component violates this policy. This is good, but we only want a component to violate a policy when Age is less than three years, and popularity is below 50%. We understand that there may be circumstances where a component might need to fall outside one of those boundaries, but if it's both, we know we have a problem. Our component is pretty popular, so it might be a case where this component, even though it is newer than we prefer, actually resolves an issue another component might have. For this reason, the best policy for us to choose is Policy 2, and our component would not actually cause a violation.

Available Conditions

The following list enumerates the available conditions and describes the operator and the value used for the evaluation.

Age

Verify if the components age based on the date it was placed in the Central Repository in months, days or years is older or younger than a specified value.

Coordinates

Verify if the coordinates for a component *match* or *do not match* (e.g. *groupId:artifactId:version*).

The coordinates may be fixed, or a wildcard can be used. For example, *org.sonatype.com:nexus-indexer:1.**. Here, components with a groupId of org.sonatype.com, an artifactId of nexus-indexer, and any version starting with 1. would be matched.

Note

This condition is only applicable for Maven components.

Additional Examples

- A fixed coordinate: *org.sonatype.nexus:nexus-indexer:1.0*
 - A wildcard coordinate to an inclusive group and version: *org.sonatype*:nexus-indexer:1.**
- this condition would match, for example *org.sonatypetest* or *org.sonatype.example*, an artifact named *nexus-indexer* in these groups, and any version that starts with *1.* for those groups and that specific artifact.
-

Note

The use of the wildcard is limited to the end of each parameter in the coordinate.

Identification Source

Verify if the component identification *is* or *is not* based on data from *Sonatype* or your *Manual* identification

Label

Verify if a label with a specific label name *is* or *is not* attached to a component

License

Verify if the component license *is* or *is not* a specified license. If the component license has been overridden, anything listed as declared or observed will be ignored. If license status is not overridden, then any occurrence of the selected license (observed or declared) will be considered a violation.

License Threat Group

Verify if the components license *is* or *is not* in one of the groups *Banned*, *Copyleft*, *Liberal*, *Non Standard*, *Not Observed* or *Weak Copyleft*. If the component license has been overridden anything listed as declared or observed will be ignored. If license status is not overridden, then any occurrence of the selected license (observed or declared) in the selected License Threat Group, will be considered a violation.

License Threat Group Level

Verify if the components license threat in its license threat group is either lesser <, lesser or equal <\= , greater > or greater or equal >\= a specified value. Value range from zero for no threat to the highest threat level value of ten.

License Status

Verify if the user defined License Status *is* or *is not* one of the possible values of *Open*, *Acknowledged*, *Not Applicable* or *Confirmed*.

Match State

Verify if the match of the comparison of the component to known components from the Central Repository with the same coordinates *is* or *is not exact*, *similar* or *unknown*.

Proprietary

Verify if a component *is* or *is not* considered proprietary.

Relative Popularity (Percentage)

Verify if the relative popularity of the component version as compared to other versions of the same component group and artifact parameter is either lesser <, lesser or equal <=, greater > or greater or equal >= a specified percent value.

Security Vulnerability

Verify if a security vulnerability is *present* or *absent*. Keep in mind that just because there is no known, or *present*, security issue, doesn't necessarily mean none exists.

Security Vulnerability Severity

Verify if a security vulnerability with a numeric severity is either lesser <, lesser or equal <=, greater > or greater or equal >= a specified value.

Security Vulnerability Status

Verify if a the components security vulnerability status *is* or *is not* one of the possible values of *Open*, *Acknowledged*, *Not Applicable* or *Confirmed*.

Now that you know about all the available conditions and how they can be combined to match all or any condition to create a constraint we are ready to determine what should happen if a constraint is met - the policy actions.

3.5.7 Step 6: Set Policy Actions And Notifications

Policy actions and notifications allow you to tell CLM to perform a specific function when violations occur. In some cases this can include forcing a particular action in one of the Sonatype CLM Tools (e.g. Sonatype CLM for Bamboo - installed separately from the Sonatype CLM Server).

Alternatively, notifications can be set so that when violations occur, any combination of particular email addresses, or the email addresses associated with the members of a particular CLM role, will be notified.

3.5.7.1 Actions

Actions are organized by enforcement point. In Sonatype CLM, enforcement points represent a stage in Component Lifecycle Management (i.e. Development, Build, Stage, Stage Release, and Operate).

For each stage there are two degrees of action you can assign to each enforcement point:

- Warn - generally will not break the process, and only displays violations that have occurred (e.g. Nexus CLM will display a warning during staging).
- Fail - generally will break the process (e.g. prevent a build in Sonatype CLM for Bamboo).

To add actions:

1. First make sure you have:
 - a. The policy open to edit (have clicked the edit icon - shaped like a pencil).
 - b. A minimum of owner rights (a member of the owner role) for the application or organization the policy resides in.
2. Next, click on either the warn or fail action in the column for the particular stage. An icon will confirm your selection.
3. Click *Save*, or proceed to adding notification in the next section.

Actions	Enforcement Points			Notifications
	Stage	Warn	Fail	
Develop				<input checked="" type="checkbox"/>
Build		⚠		<input checked="" type="checkbox"/>
Stage Release		⚠		<input checked="" type="checkbox"/>
Release			❗	<input checked="" type="checkbox"/>
Operate				<input checked="" type="checkbox"/> ArchitectureLead@MyCompany.com

Figure 3.12: Policy Actions Example

Tip

Take care in being too anxious to stop your development cycle using an action. For example, setting the Fail action at the Build enforcement point.

3.5.7.2 Notifications

When a new violation occurs, a notification will be sent. This includes any email addresses entered manually, as well as email addresses for the users that have been added to any roles selected.

To add notifications:

1. Click anywhere within the notifications field. This will display a modal allowing you to select a role or enter a specific email address.
2. Enter an email address manually, and or select any roles you wish to be notified.
3. Click *Save*.

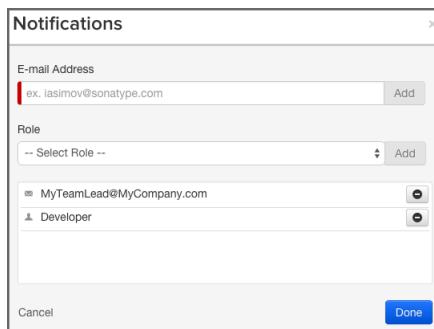


Figure 3.13: Policy Notifications Example

Note

When a notification is sent, it will only display new violations found in the latest scan. If you find yourself not receiving notification, verify there are new violations, as well as confirm you have configured your Sonatype CLM server SMTP settings.

3.5.7.3 Stages

Both Actions and Notifications are set by stage. A description for each stage as well as suggested actions and/or notifications have been listed below.

Develop - (e.g.g Sonatype CLM for Eclipse)

Definition

The **Develop** stage represents development.

Suggested Actions

While actions and notifications can be configured for this stage, they will not affect the functionality of Eclipse.

Build - (e.g.g Sonatype CLM for Bamboo or Hudson/Jenkins)

Definition

The **Build** stage represents actions in tools using during the building of your applications.

Suggested Actions

As you manage policy, making necessary adjustments over time, it's best to take an approach that allows for your development teams to be eased into dealing with violations. For this reason, it's better to start by simply warning when the build for an application contains components that violate your policies.

Suggested Notifications

Consider setting up notifications to both inform Application Owners, as well as developers.

Stage Release (Nexus Pro CLM)

Definition

The **Stage Release** stage is specific to Nexus CLM, and involves placing a near final build into a staging repository prior to having it officially released.

Suggested Actions

Because this stage gives the opportunity to prevent an application from being released with components that have violated policy, setting the action for a Stage Release to Fail is our recommendation. This is especially true for any policies that may include risk associated with security and/or licensing.

Suggested Notifications

If something fails, the development process can't move forward. Make sure to notify any members of the team responsible for the release of the application and capable of researching and addressing any violations.

Release (Nexus Pro CLM)

Definition

The **Release** stage is the final push for a project into production.

Suggested Actions

While there should be the closest scrutiny of policy violations at this point, there will be a similar recommendation to fail a release based on severe violations. In most cases, you should ideally be finding new violations only.

Suggested Notifications

Similar to **Stage Release** make sure all stakeholders, that is those members responsible for ensuring an application does not go into production with policy violations, are notified.

Tip

If you have setup policy monitoring, it is a good idea to monitor your release stage, as this is likely the best representation of your production application.

Operate

Definition

The **Operate** stage represents the best known example of the application in its production state. It can be set via a variety of tools, but in all of these cases, it is set manually.

Suggested Actions

For this reason, providing any warning or fail actions will not produce any different result.

Suggested Notifications

Typically the application owner, or anyone responsible for ongoing maintenance of an application in production should be notified. However, remember that evaluation in the **Operate** stage is manual.

3.5.8 Summary

Congratulations! You should now have created a custom policy that checks for a specific age and popularity of all the components. If you've been using the stand alone scanner, or if you are already using other enforcement points, take a look at how your applications react to this new policy. Here are the highlights you should know about:

- Create a Custom Policy
- Understand Advantages of Multiple Constraints
- Best Practices for Actions and Stages

3.6 Policy Elements

One of the more interesting pieces of Sonatype CLM Policy, and something we've only alluded to in a number of our guides, is policy elements. At this time there two specific policy elements we can work with:

- Labels
- License Threat Groups
- Tags

These elements are unique in that they have both links to policy as well as general Sonatype CLM functionality. Let's take a closer look at each one of these.

3.6.1 What is a Label?

We just learned all about creating policies. Constraints, conditions and even actions, all make a lot of sense, but what in the world could labels have to do with policy?

Well, labels are actually one of the more powerful features of Sonatype CLM. They should have a familiar look, since you've likely used other systems that employ a sort of tagging or labeling.

Labels are metadata. More specifically a label is metadata that is assigned to a component within the context of a particular application or organization. Labels can assist with identifying components you want to review, approve, or even avoid altogether. We call this label assignment.

When labels are assigned, this is an action that takes place in the application composition report. Before it can be assigned though, a label needs to exist for a particular organization or application.

As we learned in our section regarding Organizations vs. Applications, inheritance plays a big role in policy. The same thing is true for labels, in that if a label is created in an organization, any application attached to that organization will also have the label available for use when assigned. In fact, the system will prompt you to choose the scope (organization or application) a label should exist in when it is assigned.

3.6.2 Creating, Editing and Deleting a Label

We've determined that assigning a label is an important action, but how do we build policy around this? That's actually simple, we just add a condition, based on a specific label that you have created, being present. The one caveat, is that the label needs to exist within the application or the organization in which you are creating the condition.

There are two key ways to create a label:

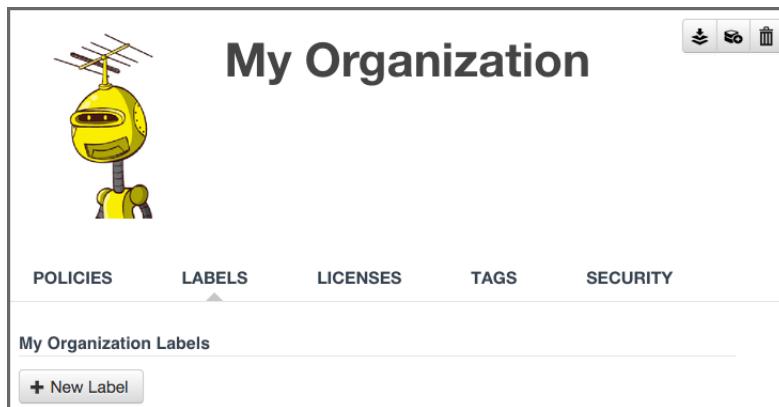


Figure 3.14: Using New Label Button



Figure 3.15: Using Global Create Button

There is really no difference here, as both require that you have the organization or application open at the time of creation. The one advantage with using the Global Create button is that you can create no matter which tab of the currently selected organization or application you are in, whereas you will need to be on the Label tab otherwise.

When creating your label, remember to use something that is easily identifiable. If you're following along with our example in the next section, *Architecture-Approved* is a good example.

The screenshot shows a dialog box titled 'Label Example'. It has a 'Label Name' field containing 'Architecture-Approved'. Below it is a 'Select Color' section with a grid of nine color swatches, each labeled 'Architecture-Approved'. The colors include blue, green, dark grey, orange, red, and two shades of blue. A 'Description' field contains the text 'Component is approved by the Software Architecture Lead.' At the bottom are 'Cancel' and 'Save' buttons.

Figure 3.16: Label Example

Once you have entered the name, you can enter an optional description, and then click the *Save* button.

Editing Labels

To make changes to a label, click on the label and the label information will be displayed below.

Deleting Labels

To delete a label, just click on the X next to the label name.

A few things to remember:

- An organization's labels can be seen by any of its applications, the reverse is not true.
- Labels can only be edited (or deleted) at the level they were created.

3.6.3 Creating a Condition Based on a Label

In the example below a new condition for the label *Architecture-Approved* will be added to an existing policy with an existing constraint and condition.

In our instructions, we've made an assumption that you understand how to [create a policy](#).

The screenshot shows the 'Constraints' section of a policy configuration. It contains two conditions defined by dropdown menus:

- First condition: Age (selected) > 3 Years.
- Second condition: Label (selected) ≠ Architecture-Approved.

A note at the bottom indicates that all listed conditions must be met for the constraint to trigger. There are buttons for adding (+) and removing (-) conditions.

Figure 3.17: Creating a Label Condition

1. Open an existing policy.
2. In the *Constraints* area of the policy, click on the + icon, located next to the right of an existing condition.

Tip

Make sure you use the correct + icon, as it can be easy to add a new constraint by mistake.

3. Now, in the *Conditions* area, change *Label* in the first drop down menu from *Age* to 'Label'.
4. Next, in the second drop down menu select *is not* for the operator.
5. Finally, in the third drop down menu, select the *Architecture-Approved* label you just created.
6. Click the *Save* button to finish.

Tip

Because our example uses a constraint with an existing condition, we have also chosen to force a violation only when all conditions have been met. In this scenario it may be appropriate to consider a waiver as an alternative.

3.6.4 What is a License Threat Group?

License threat groups, are simply groups of licenses, broken into categories of severity for the various types of licenses. They can help you to achieve your goals related to enforcing the usage of components with licensing that matches the scope of your application.

Their primary purpose is to serve as the data points for the License section of the application composition report. Moreover, they are a way to group risk, associated with licensing. By default, there are four license threat groups included with Sonatype CLM:

Copyleft

Strong copyleft licenses go a step further from weak copyleft licenses and mandate that any distributed software that links or otherwise incorporates such code be licensed under compatible licenses, which are a subset of the available open-source licenses. As a result, these licenses have been called viral.

Non Standard

Something out of the ordinary (e.g. If we ever meet, give me a beer license).

Weak Copyleft

Free software licenses that mandate that source code that descended from software licensed under them, will remain under the same, weak copyleft, license. However, one can link to weak copyleft code from code under a different license (including non-open-source code), or otherwise incorporate it in a larger software. Otherwise, weak copyleft licenses allow free distribution, use , selling copies of the code or the binaries (as long as the binaries are accompanied by the (unobfuscated) source code), etc.

Liberal

These licenses allow you to do almost anything conceivable with the program and its source code, including distributing them, selling them, using the resultant software for any purpose, incorporating into other software, or even converting copies to different licenses, including that of non-free (so-called “proprietary”) software.

Note

Consult with your legal department for EXACT definitions. Information provided above is from the following [reference](#).

3.6.5 Creating, Editing, and Deleting a License Threat Group

An important aspect of license threat groups is that each one also has a threat level, just like policy (from zero signifying no threat all the way up to 10). Unless you have specific legal recommendation / council, the default license threat groups will suffice, especially in the beginning.

If you desire, you can edit these default groups, or create entirely new ones. When creating license threat groups, keep in mind that they will be inherited from the organization to all associated applications.

There are two key ways to create a license threat group:



Figure 3.18: Using New License Threat Group Button



Figure 3.19: Using Global Create Button

There is really no difference here, as both require that you have the organization or application open at the time of creation. The one advantage with using the Global Create button is that you can create no matter which tab of the currently selected organization or application you are in, whereas you will need to be on the License tab otherwise.

The following information needs to be completed before a license threat group can be saved.

Name

This is the name for your license threat group. When creating or editing the name of a license threat group, remember to use something that is easily identifiable. If you're following along with our example in the next section, use *Banned Licenses*.

Threat Level

This is the level of threat this group of licenses should represent.

Applied and Available Licenses

Adding licenses to the license threat group is not an actual requirement, but there really isn't much use for simply creating a group as a placeholder. So this is treated as a required field.

On the left are licenses that are included in the license threat group. Click on a license to remove it.

+ On the right are the licenses that can be added the group. Click on a license to add it.

When everything is done your screen should look like Figure 3.17 and you can click the *Save* button to finish.

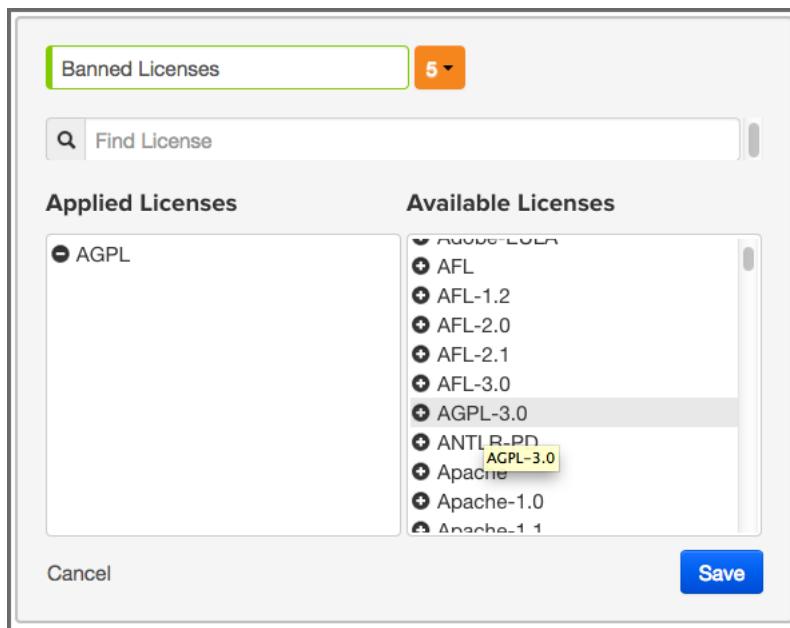


Figure 3.20: Creating a License Threat Group

Editing

To make changes to a license threat group, click on the *Edit* icon (shaped like a pencil).

Deleting

To delete a license threat group, just click on the *Delete* icon (shaped like a trash can) next to the label name.

A few things to remember:

- A set of four default license threat groups are provided.

- Applications inherit license threat groups from their organization.
- An organization's license threat groups can be seen by any of its applications, the reverse is not true.
- License threat groups can only be edited (or deleted) at the level they were created.

3.6.6 Creating a Condition Based on a License Threat Group

In the example below a new condition for the license threat group, *Banned Licenses*, will be added to an new policy.

In our instructions, we've made an assumption that you understand how to [create a policy](#).

1. Create a new policy.
2. In the *Constraints* area click on the *Expand/Collapse* icon (shaped like a right-facing triangle). It's next to the *Constraint Name* and should display *Unnamed Constraint*.
3. Once the constraint is expanded, click the *Constraint Name* field and enter *Banned License*.
4. Now, in the *Conditions* area, change *Age* in the first drop down menu to *License Threat Group*.
5. Next, in the second drop down menu choose *is* for the operator.
6. Finally, in the third drop down menu, find and select the *Banned License* label you just created.
7. Click the *Save* button to finish.

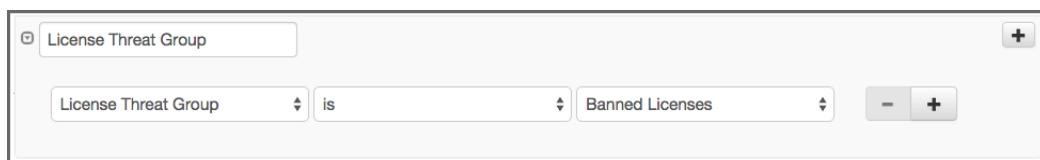


Figure 3.21: Creating a Condition Evaluating a License Threat Group

3.6.7 Creating a Condition Based on an Unassigned License Threat Group

In most cases, a license is associated with one or more [License Threat Groups](#). However, it is possible for a license to have no association with any [License Threat Group](#). You can create a Policy to detect when a component has a license that is not assigned to any License Threat Group.

In the example below a new condition for detecting components with licenses not assigned to any License Threat Group will be added to a new policy.

In our instructions, we've made an assumption that you understand how to [create a policy](#).

1. Create a new policy.
2. In the *Constraints* area click on the *Expand/Collapse* icon (shaped like a right-facing triangle). It's next to the *Constraint Name* and should display *Unnamed Constraint*.
3. Once the constraint is expanded, click the *Constraint Name* field and enter *Unassigned LTG*.
4. Now, in the *Conditions* area, change *Age* in the first drop down menu to *License Threat Group*.
5. Next, in the second drop down menu choose *is* for the operator.
6. Finally, in the third drop down menu, find and select *[unassigned]*.
7. Click the *Save* button to finish.

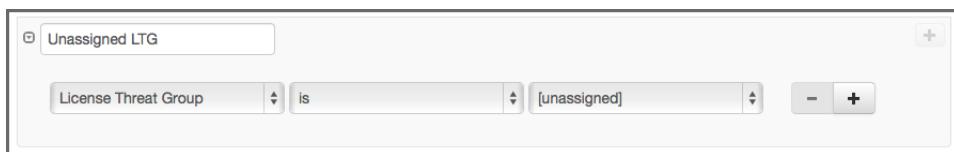


Figure 3.22: Creating a Condition Evaluating an unassigned License Threat Group

A violation of the policy above can be remediated simply by assigning the license involved to a [License Threat Group](#).

To remediate a specific component, use the Component Information Panel (CIP) *License* tab to set the license *Status* to *Selected* or *Overridden*, and then select a license that is associated with at least one [License Threat Group](#). Managing component licenses is discussed further in the [Editing License Status and Information](#) section.

3.6.8 What is a Tag?

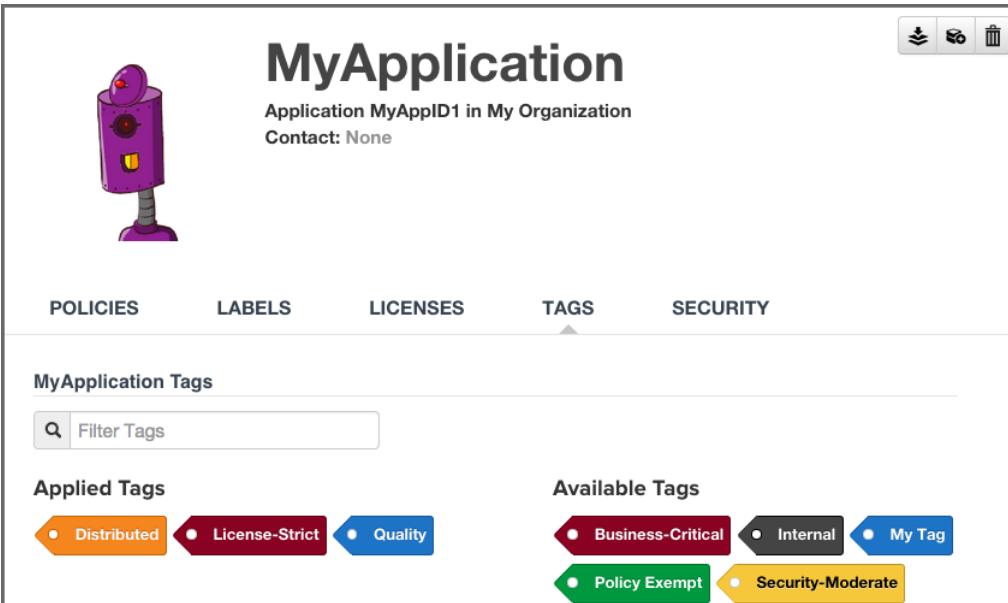
In any given business, you could have hundreds, maybe even thousands of applications. Even if you are just getting started, it's likely you have a handful of applications. However, as unique as applications can be, they tend to share some similarities.

For example, you might have applications that process or store sensitive information, maybe even personally identifiable information for your users. Since attacks are often aimed at these types of applications, you will definitely want to make sure your policies that identify high and critical threat security vulnerabilities are included during the evaluation of these types of applications.

Unfortunately, especially as the number of applications in your business increases, identifying an application by name may not be helpful. To address this, tags provide a way to quickly identify characteristics of an application.

Using specific text and color, tags can help group particular applications with similar attributes. While the tag can ultimately be anything you want, and attached to any application, you will want to take a much more thought-out approach, similar to what is recommended for labels.

As we will see later, in order to maximize the benefits tags can offer, you will want to take advantage of tag matching between policies and applications. For now though, let's see how to create, apply, and delete tags.



The screenshot shows the Sonatype CLM application interface for managing applications. At the top, there is a header with the application name "MyApplication", its ID "MyApplID1", and its organization "My Organization". Below the header, there are tabs for "POLICIES", "LABELS", "LICENSES", "TAGS", and "SECURITY". The "TAGS" tab is currently selected, indicated by a downward-pointing triangle icon. Under the "TAGS" tab, there is a section titled "MyApplication Tags" with a "Filter Tags" input field. Below this, there are two sections: "Applied Tags" and "Available Tags". The "Applied Tags" section contains three tags: "Distributed" (orange), "License-Strict" (red), and "Quality" (blue). The "Available Tags" section contains five tags: "Business-Critical" (red), "Internal" (black), "My Tag" (blue), "Policy Exempt" (green), and "Security-Moderate" (yellow). Each tag is represented by a small circular icon with a dot and a colored rectangular background.

Figure 3.23: Example of Applied Tags

3.6.9 Creating, Editing, and Deleting Tags

Tags are created, edited, and deleted at the organization level and then applied individually for each application. There are two key ways to create a tag, again, only done at the organization level.



Figure 3.24: Using New Tag Button



Figure 3.25: Using Global Create Button

There is really no difference here, as both require that you have the organization open at the time of creation. The one advantage with using the Global Create button is that you can create a tag no matter which tab of the currently selected organization you are in, whereas you will need to be on the Tags tab otherwise.

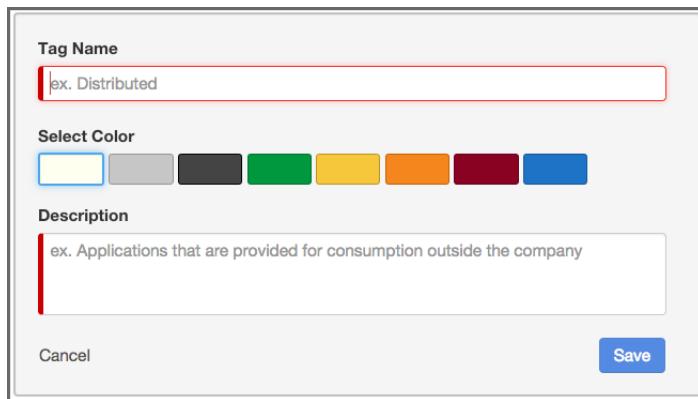


Figure 3.26: Creating a Tag

There are three elements of tag:

Tag Name

When creating your tag, keep in mind that the tag describes characteristics of an application, and will be used to match an application to corresponding policies. The name should be easily identified by the user.

Tag Description

The tag description is displayed when a user hovers the mouse over the tag. This can offer additional information, such as the types of policies that will be matched to applications that have applied the tag.

Tag

Color

The color selection is left to however your organization chooses to implement. The default is white.

If you made a mistake and want to edit the tag, simply click on the tag body (anything but the *x*), and you can edit the tag information. However, if you want to permanently delete the tag, click on the *x*.



Figure 3.27: Example of Tags with Description

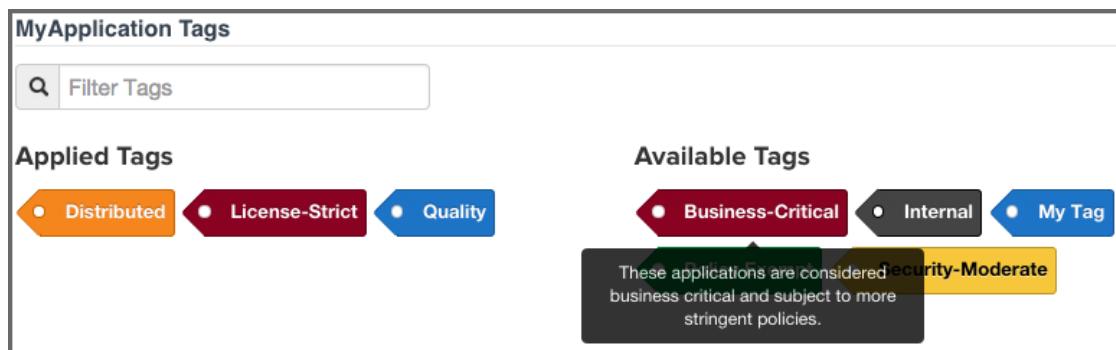
Note

Deleting any tag will ask for you to confirm, since that action can not be undone. If the tag is currently applied to an application you will be shown the names of all applications that would be affected before you confirm the deletion. You will not be able to delete a tag that has already been related to a policy, and will be shown the names of any related policies if you try. Should you still wish to delete the tag, you will have to disassociate it from any related policies first.

3.6.10 Applying a Tag

Depending on how your business uses tags, and establishes control within CLM, the people applying tags may be different from those creating them. It is important though to understand that while tags are provided to identify characteristics of an application, a more important usage is to provide a way for policy managers to create specific policies that consider those application characteristics. For this reason, when applying a tag, your application may be evaluated by a specific set of policies. This is a good thing, but it also makes the application of tags an act that requires careful consideration. To apply a tag to an application, follow the instructions below.

1. First, log in to the Sonatype CLM Server using a user account with at least Owner-level permissions for the application (a member of the Owner Group).
2. Next, click on the *Application* link, and then click on the *application* you want to apply the tag to. The **Application Management** area will be displayed.
3. Now, click on *Tags* tab. There are two columns, one for available tags, as well as those that have already been applied. Simply click on the tag to move it from one column to the other. If there are a lot of tags, and you are having trouble locating a specific one, simply type in the filter the name of tag you would like to use.

**Tip**

Mouse over a tag to see the full description.

3.6.11 Matching Policies to Specific Applications

By now, you have likely created tags, and perhaps even applied some to your applications. Those are great features, but the real power of tags comes when we match a policy to a specific set of applications.

Up to this point (before tags), an organization-level policy would apply to all applications. To address this, you could create a new organization, or develop specific policies for each application, but in both cases, that results in a lot of micromanagement. In contrast, tags provide an opportunity to create a policy and then pick unique groups of applications (based on their applied tags) the policy should be evaluated against.

Given this, it is important to think about the applications your business develops, as well as the types of policies you will use to evaluate your applications. Elements like the type of data, the exposure (public or private), as well as whether or not the application interfaces with the Internet, are a great place to start.

When you create your tags, make sure that it's clear to users that will be using the tags. In other words, it shouldn't be ambiguous as to the type of applications the tags represent. For example instead of creating the tag, *External*, a more descriptive tag would be *Distributed*. Some additional tag suggestions might be:

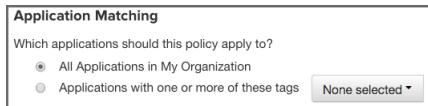
- Sensitive Information
- Personal Information

These are just suggestions of course, but you should get the key point. When adding a tag to an application, you can expect policies that have identified the same tag to be evaluated against your application.

Now, that's quite a bit of discussion on the theory and proper way to utilize tags, let's take a look at how to make the match happen.

To select the tag a policy will be evaluated against:

1. Create a new policy, or edit an existing one.
2. In the Application Tags area of the policy editor, choose the tags that represent the applications you want to evaluate the policy against. By default, no tags will be selected. This means the policy will apply to all application regardless of their tags.
3. Finish creating or editing your policy and click the *save* button. From this point forward, the policy will be evaluated against applications based on the tags you selected. In addition, applications will only see the policies they are evaluated against.



3.6.12 Viewing Tag-based Policies

Policies that have been set to match applications with specific tags are visible in the same area as all other policies. However, there is a slight difference between what is displayed at the organization level and the application level.

At the organization level

All policies for the organization will be displayed. Policies that have selected specific applications, based on a matching tags applied to those applications, will be indicated by a special icon.

At the application level

Only the policies that an application is evaluated against will be displayed in the Policy tab. This includes:

- Policies created at the organization level, and set to match all applications.
- Policies created at the organization level, and set to match specific tags currently applied to the application.

- Policies created at the application level.

Tip

When viewing policies at the application level, be sure to look for the special tag icon , which indicates the application is evaluated against the policy given a tag (or tags) applied to the application.

3.6.13 Summary

It can be easy to forget about policy elements, and in most cases these should be reserved for more advanced users. For example, deciding what labels to use, and binding them to a specific process is very important in helping to ensure they aren't overused. Equally important is creating tags that will provide an automatic evaluation of applications against policies with matching tags. In the case of license threat groups, you likely want to consult your legal team to make sure you remain compliant to parameters they have established. In fact, if you haven't already they should be included in your policy development discussions.

As far as this section goes, here's what you should have taken away.

- Understanding policy elements (labels, license threat groups, and tags).
- Create a label and a condition based on it.
- Create a license threat group and a condition based on it.
- Create tags at the organization level, and apply to applications.
- Understand the impact of matching policies to applications using tags.

3.7 Manual Application Evaluation

In order to evaluate an application, you need to have created at least one organization and one application, as well as created or imported at least one policy at either the organization or application level. You will also need to make sure you have the proper permissions to view report information for the application you wish to evaluate.

While evaluations can be initiated from various tools featuring CLM integration (e.g. Sonatype CLM for CI, IDE, and Nexus Pro), the quickest way to get started is to perform an evaluation via the CLM server.

This will generate a report for your application quite easily, and is a great way to create a quick baseline of your application's health.

3.7.1 Evaluating via the CLM Server

As mentioned previously, before you can evaluate an application, you will need to make sure you have:

- Created an organization
- Created an application
- Imported or created a policy

With the above complete, you are ready to evaluate an application via the CLM Server.

1. First, log in to the CLM Server. At a minimum you will need to be a member of the Application Owner role.
2. Next, click the *Organizational Design* icon  to access the **Organizational Design** area. Once there, click *Applications* (located in the menu on the left side of the screen), and then choose an application.
3. In the top right of the **Application Management** area, click the *Evaluate an Application* icon .
4. A modal dialog will display providing a number of required fields.
 - a. First, choose the bundle (application) you want evaluated. Clicking *Choose File* will allow you to browse your directories for the application you wish to evaluate.
 - b. Next, choose the application in Sonatype CLM you want to associate with the evaluation. By default, this will be pre-populated with the name of the application you first selected.
 - c. After choosing the application to evaluate, you will need to specify the stage, this will affect where the report is displayed, and will overwrite the most recent report for the application and stage selected.
 - d. Finally, if you have configured notifications for your policy, or policies, you can choose whether or not you want those notifications sent.
5. Click the *Upload* button to begin evaluating the chosen application.

6. The Evaluation Status will display, showing you the progress of your evaluation. When complete, you can click the *View Report* button to view the results of your evaluation.

The screenshot shows a modal dialog titled "Evaluate an Application". It contains the following fields:

- "Select the file you want evaluated": A file input field with the value "my-app-archive.zip".
- "Which application is this file associated with?": A dropdown menu showing "MyApplication".
- "Which CLM stage should this evaluation be associated with?": A dropdown menu showing "Release".
- "Should notifications be sent if this application violates any policies?": A radio button group where "Yes" is selected.
- "Cancel" and "Upload" buttons at the bottom right.

Figure 3.28: Evaluate an Application

Note

You can also evaluate an application via the *Organizations* area, simply click on *Organizations* instead of *Applications* and follow the instructions from there. You will still need to have created an application, and the application won't be pre-filled for you in the form.

3.7.2 Successful Evaluations and Report Generation

If your evaluation completed successfully, a report will be generated for the application.

The log output of the command execution will provide a summary as well as a link to the produced results similar to

```
[INFO] Policy Action: Warning  
[INFO] Summary of policy violations: 4 critical, 85 severe, 46 moderate
```

[INFO] The detailed report can be viewed online
at <http://localhost:8070/ui/links/application/my-app/report/95c4c14e>

This report is available on the Sonatype CLM Server in the *Reports* section. If you kept our defaults, the report will be listed under the Build Stage. So, what are you waiting for? You should see something similar to the results displayed in Figure 3.29

Application Name ▼	Build Violations	Stage Release Violations	Release Violations	Contact	Organization
 MyApplication	28 159 3 1 minute ago	28 159 3 1 minute ago			My Organization
 My Application 4			6 5 1 month ago		My Organization 3
 My Application 3	6 11 1 5 months ago				My Organization 7
 My Application 2	6 11 1 5 months ago	6 11 1 1 month ago	6 11 1 6 months ago	John Smith	My Organization 4

Figure 3.29: Violations Report after Scan

Note

As mentioned previously, if you specify a stage not represented by in the Sonatype CLM Server, there will not be a visible link to the report.

3.7.3 Summary

Did you get a chance to evaluate some application? Pretty simple right? Your main goal should be to scan an application, which will vet components against the policy assigned either at the organization or application level. If you haven't already, be sure to go to the Sonatype CLM Server, and check out the results of your report.

3.8 Reviewing Evaluation Results

The Application Composition Report provides the results of an evaluation of your application. The results are broken into three key categories:

- Policy Violations
- Security Vulnerabilities
- License Issues.

As mentioned previously, this will be the same report, whether you are using the stand-alone scanner, the CLM Maven plugin, the manual evaluation, or any of the integrated enforcement points (e.g. Sonatype CLM for CI, IDE, Nexus Pro).

Let's take a look at how to access the report first.

Note

Depending on the enforcement point, or the stage options you manually selected, your report may be listed under different stages in the *Reporting* area of the Sonatype CLM Server. For example, the default location for the stand alone scanner, is the build stage.

3.8.1 Accessing the Application Composition Report

No matter how the scan was performed, all reports reside on the Sonatype CLM Server and are automatically associated with the corresponding application (via the application identifier). However, there are two distinct ways to access the Application Composition reports.

Via the Reports Area

When you log into the Sonatype CLM Server the Dashboard is displayed by default. Click the *Reports* icon . If multiple applications have been scanned, you will see all of them here.

Note

You will need to be a member of at least the developer group for the application you wish to see a report for.

**Important**

Users of Nexus CLM Edition do not have access to the Sonatype CLM Dashboard. Because of this, these users will not be taken to the dashboard after logging in, nor will they see the dashboard icon. Rather, the reports area will display by default.

Each application has a separate row with columns for:

- Application Name
- Violations (by stage)
- Contact
- Organization (for the corresponding application)

Each Violation column contains a Violation Summary (total counts for *Critical*, *Severe* and *Moderate* policy violations). In addition, the time the last report was generated (e.g. *2 minutes ago*) is provided.

To access the Application Composition report, click the Violation Summary for the corresponding application and stage.

Filter Applications						
Application Name ▼	Build Violations	Stage Release Violations	Release Violations	Contact	Organization	
 MyApplication	28 159 3 1 minute ago	28 159 3 1 minute ago			My Organization	
 My Application 4			6 5		My Organization 3	
 My Application 3	6 11 1 5 months ago				My Organization 7	
 My Application 2	6 11 1 5 months ago	6 11 1 1 month ago	6 11 1 6 months ago	John Smith	My Organization 4	

Figure 3.30: Reporting Area

Tip

By default this view will be sorted alphabetically by the application name. In addition to the filter, you can also click on the application or organization columns to sort alphabetically ascending/descending.

Via the Application Area

The Application area is the same place where you can manage policy for your application, reviewing policies unique to the application, as well as those inherited from the organization. Located just below the application identifier and organization, you will see three columns:

- Build
- Stage Release
- Release

These represent the Sonatype CLM stage where the report was generated for/from. For example, if you use the Sonatype CLM stand-alone scanner and don't specify the CLM Stage, it will default to build. When your scan completes and the report is uploaded, it would appear below *Build*. This is highlighted in Figure 3.31.



Figure 3.31: Application Area

3.8.2 Reviewing the Report

At first glance, you may be surprised at what you see. If you expected an application to have no issues, and now see it has a great deal, don't get upset... yet.

In many cases, a policy can be too stringent or may indicate issues that are not exactly applicable to your application. For example, you may have a security issue that would only affect applications exposed to the public, while your application is for internal use only. Another great example is a license that constrains your code in the event you intend to sell the application.

With that worry out of the way, let's take a look at what's actually in each report.

The *Summary* tab of the report shows a breakdown of what was found. This includes counts for policy violations, security vulnerabilities and license-related issues.

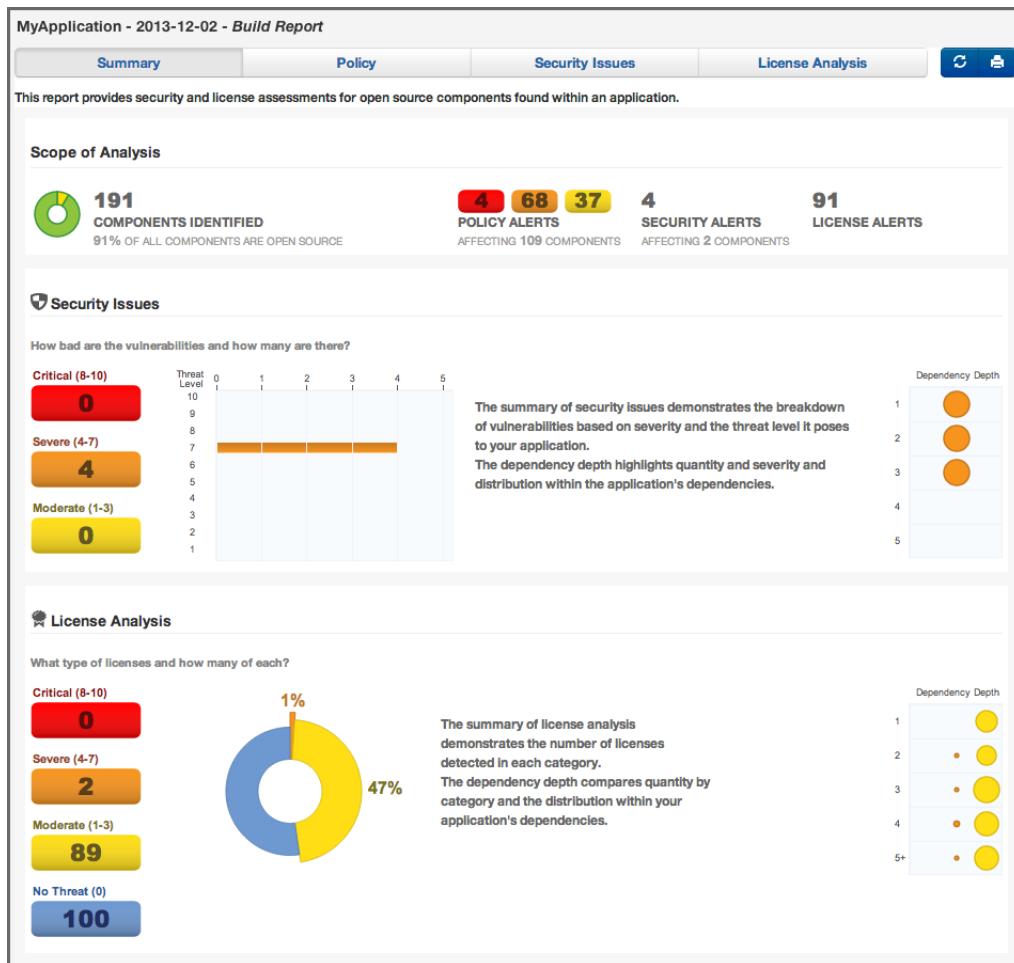


Figure 3.32: Summary Tab of an Application Composition Report

The *Policy* tab provides a list of all components that were found in your application. An example is displayed in Figure 3.33. The list of components is ordered by the level of the threat violation that has been assigned to the policy. In instances where a component has violated multiple policies, only the violation with the highest threat is displayed.

To view the other violations you can use the component information panel (described below), or change what is displayed using the Violations filter on the right. This will allow you to see all violations for your component, though that may result in the appearance of duplicated components.

Tip

We have an [entire guide](#) dedicated to the various Sonatype CLM Reports.

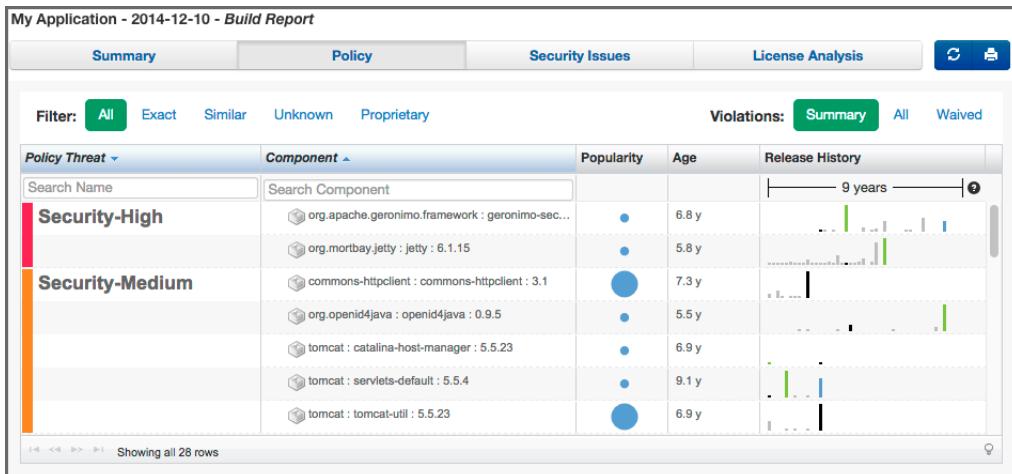


Figure 3.33: Policy Tab of an Application Composition Report

The *Security Issues* tab displayed in Figure 3.34 displays all components containing security issues.



Figure 3.34: Security Issues Tab of an Application Composition Report

The *License Analysis* tab displayed in Figure 3.35 displays all components and the determined details about their license(s).

License Threat	Component	Status
Apache-2.0, Non-Standard	com.fasterxml.jackson.core : jackson-core : 2.0.4	Open
Apache-2.0 or LGPL-2.1, Non-Standard	com.fasterxml.jackson.core : jackson-databind : 2.0.4	Open
Not Declared, CDDL-1.0	javax.transaction : jta : 1.1	Open
CDDL-1.0 or GPL-2.0-CPE, CDDL-1.1 or GPL-2.0-CF	javax.mail : mail : 1.4.2	Open
CDDL-1.0	jstl : jstl : 1.2	Open
CDDL-1.0	javax.activation : activation : 1.1	Open
GPL-3.0, LGPL-2.1+, MIT	net.sourceforge.jtds : jtds : 1.2.2	Open
CPL-1.0, No Source License	junit : junit : 4.8.1	Open

Figure 3.35: License Analysis Tab of an Application Composition Report

In the *Policy*, the *Security Issues* as well as the *License Analysis* tabs, you can get access to more information about a particular component by clicking on a row in the table representing the component you are interested. The Component Information Panel CIP, with an example displayed in Figure 3.36 shows more specific information about the component.

Group: org.apache.struts.xwork
Artifact: xwork-core
Version: 2.2.1.1
Declared License: Apache-2.0
Observed License: BSD, Apache-2.0
Effective License: Apache-2.0, BSD
Highest Policy Threat: 9 within 5 policies
Highest Security Threat: 10 within 29 security issues
Cataloged: 3 years ago
Match State: exact
Identification Source: Sonatype

Figure 3.36: Component Information Panel CIP for a Specific Component

Clicking on the *Policy* header in the component information panel displays all policy violations for the selected component. As you can see from the example displayed in Figure 3.37 the policies as well as the

constraints and the condition values that triggered the policy violation are displayed.

Policy/Action	Constraint	Condition Value	Waivers
Security-High	CVSS >=7 and <10	Found 15 Security Vulnerabilities with Severity >= 7 Found 27 Security Vulnerabilities with Severity < 10 Found 29 Security Vulnerabilities with Status OPEN	<button>Waive</button>
Security-Medium	CVSS >=4 and <7	Found 25 Security Vulnerabilities with Severity >= 4 Found 14 Security Vulnerabilities with Severity < 7 Found 29 Security Vulnerabilities with Status OPEN	<button>Waive</button>
Security-Unscored	CVSS = 0	Found 2 Security Vulnerabilities with Severity = 0 Found 29 Security Vulnerabilities with Status OPEN	<button>Waive</button>
Security-Low	CVSS < 4	Found 4 Security Vulnerabilities with Severity < 4 Found 29 Security Vulnerabilities with Status OPEN	<button>Waive</button>

Figure 3.37: Policy Section for a Specific Component Displayed on the Component Information Panel

A number of specifics used in the tabs and the panel are detailed in the following:

Threat Level

We briefly mentioned above, that policy violations are organized by threat level. The threat level breakdown is as follows.

- Red / High (10 - 8) - Indicates a component with a severe threat, and should be treated seriously.
- Orange / Medium (7 - 5) - Indicates a component with a moderate threat, and should be treated seriously.'
- Yellow / Low (4 - 2) - Indicates a component with a low threat, and may not pose any serious threat to your application.
- Dark Blue / Informational (1) - Indicates that there is a very low threat, and you should just be aware of a possible issue.
- Light Blue / None (0) - Indicates that no policy has been violated by the component.

Matching

It's likely that you started seeing an area that indicates *matching*. As a quick definition, matching employs a series of in-depth algorithms to determine if a component found in your application matches anything known to the Central Repository, or known to the Sonatype CLM Server. That's right, through a claiming process and a proprietary component configuration, you can teach Sonatype CLM to recognize components it may not have otherwise.

PDF Printing

The application composition report can be printed to PDF simply by clicking the print icon located in the upper right corner of the report.

Re-evaluation

Eventually, when you begin to manage and modify policies, you may simply want to compare the results from the most recent report with your policy modifications. The re-evaluate button, located to the left of the pdf/print icon will allow you to refresh the results without having to generate a whole new report.

3.8.3 Summary

With the ability to access and review results of your scanned applications, you are well on your way towards true governance of your components. In many ways, you are now nearing the end of the component lifecycle. Remember, even with these results your most important tool will still be communication. Don't be dismayed or persuaded by the results. Go over everything with your teams and work towards your business goals together. For now though, this is what you should take away:

- There are four tabs on a application composition report - *Summary, Policy, Security Issues and License Analysis*.
- You can inspect details about a specific component in the component information panel CIP.
- A report can be created in PDF format to allow printing.
- Refreshing a report can be triggered from the user interface.

3.9 Importing Policies

Setting up policies can be quite complex and labor intensive. To make the process easier and give you a head start we have created some sample policies and provide an import feature.

We actually recommend you don't begin using Sonatype CLM by creating a bunch of policies right out of the gate. Instead, we've created a set of policies, which include other policy elements such as labels and license threat groups, that you can import into your Sonatype CLM installation.

Eventually, and there is a very short time between now and eventually, you will need to create, or at least modify, policies. For now, we'll want to focus on populating your organizations and applications with policies provided by Sonatype.

3.9.1 Sonatype Sample Policy Set

The easiest way to establish policies for your applications is to use the sample policy set provided by Sonatype. While the included policies are not meant to be a perfect match for every business, they have been created with our extensive experience working with customers and developing policy for our own internal practices.

Our sample policy set can be downloaded here:

[Sonatype-Sample-Policy-Set.json](#)

This policy set is an example of managing components for security, licensing, and architectural issues. It also introduces the detection of unknown and patched components used in building your applications. The sample policy set can be used to gather information about the components used to build your applications without warnings and failures occurring in the developer, build, or Nexus environments.

This is the perfect set of policies to use in order to gather information and understand how policy management will work for your environment, without potentially distracting the people who are building and delivering your applications.

Note

The sample policy set includes several, preset tags. The tags have been used in the Application Matching area for a number of the included policies. Policies using the tags will be indicated by a special tag icon. In order to utilize the policies, you must have applied the corresponding tag to your application(s). For more information on tags, please see the [Policy Elements section of our Policy Management Guide](#).

3.9.2 Importing a Policy to an Organization

Once you have acquired a policy file to import, you can follow these steps:

1. Log into your Sonatype CLM server with a user account that has proper permissions to import policy for a specific organization (at least a member of the owner group for the organization would be required).
 2. Next, click the *Organizational Design* icon  to access the **Organizational Design** area.
-

3. Click on *Organizations* in the left menu, and then click the organization you wish to import the policy to.
4. Click the *Import* button in the top right corner of the organization view displayed in Figure 3.38.
5. Click the *Choose File* button in the **Import Policy** dialog displayed in Figure 3.39 and select the policy JSON file in the file browser.
6. Click the *Import* button in the **Import Policy** dialog.
7. Confirm that the list of policies contains the imported policies.

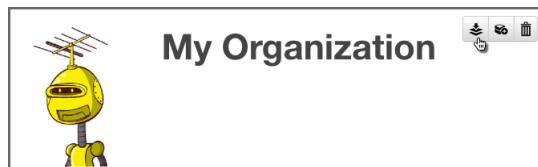


Figure 3.38: Organization View with Import Button

If you are importing to an organization, that already has some policies, labels, license threat groups, and/or tags set up, consider the following rules:

- Existing policies will be deleted during the import procedure.
- Importing policies also includes an import of associated policy elements (labels, license threat groups, and tags). The following logic will be used for Policy Elements:
 - Labels - the CLM server attempts to match labels against existing ones in a case-insensitive manner. This allows for updating the description or color of existing labels, while preserving any triage effort already done to apply these labels to components. If your import contains labels that aren't already present in the system, they will be created.
 - License Threat Groups - the CLM server will delete all existing license threat groups, and then import the new ones.
 - Tags - the CLM Server attempts to match tags against existing ones in a case-insensitive manner. This allows for updating the description or color of existing tags, while preserving any current matching of tags between policies and applications.



Figure 3.39: Import Policy Dialog

3.9.3 Importing a Policy to an Application

An application inherits policies from the organization. However it can be useful to have additional policies for fine grained control.

1. Log into your Sonatype CLM server with a user account with an **Administrator** role or as an **Owner** of the application you wish to import policy to.
2. Next, click the *Organizational Design* icon  to access the **Organizational Design** area.
3. Two columns will be displayed on the left. Click on *Applications*, and then click the application you chose to import the policy to.
4. Click the *Import* button in the top right corner of the application view, which is identical to the organization view displayed in Figure 3.38.
5. Click the *Choose File* button in the **Import Policy** dialog displayed in Figure 3.39 and select the policy JSON file in the file browser.
6. Click the *Import* button in the **Import Policy** dialog.
7. Confirm that the list of policies contains the imported policies.

The policy information will be imported, and the following rules will be applied:

- Duplication of organization policies is invalid, so you will not be able to import the same policy file into an organization and then into an application associated to it.

- When a policy is imported, any existing application policies will be deleted and replaced with the imported configuration.
- For label imports, the same logic as during imports at the organization level described in Section [3.9.2](#) applies.
- Attempting to import policies that contain tags will cause the entire import to fail.

3.9.4 Summary

If you are having trouble coming up with your own, custom policies, importing any of our sample policies can be a great way to get started. While this may not be an exact fit, in most situations it provides a good baseline for improving the health of your applications. Better yet, if you want to modify the policies after import, you can do that as well.

3.10 Policy Monitoring

At some point, your applications will be out of development, have completed their final build, moved beyond staging, and have been officially released. However, while there shouldn't be changes to your application that is now considered to be in production, new security vulnerabilities and license issues could arise. For this reason, as well as any other, Sonatype CLM allows you to monitor individual policies for each application.

When a policy is monitored, you pick an application, as well as a Sonatype CLM stage to monitor to use as a base for evaluating policy against. After that we'll show you how to configure which policies you would like to receive a notification for, given a component is found to be in violation.

If some of this sounds familiar, that's good, because it is nearly identical to standard policy evaluation, component violations, and the notification option for policies. There really is no difference other than being able to choose which Sonatype CLM stage you will use for monitoring. Though that is a powerful option.

In this section, we'll cover everything you need to setup policy monitoring at the organization and application level. In general, we make a few assumptions, including:

- You have your Sonatype CLM Server up and running, and accessible.

- You have created an organization and an application, as well as setup or imported some basic policies.
- You are somewhat familiar with the Sonatype CLM Server.

If any of these sounds like strange concepts, you'll want take a few steps back and go over those topics first. With that said, let's go monitor some policies.

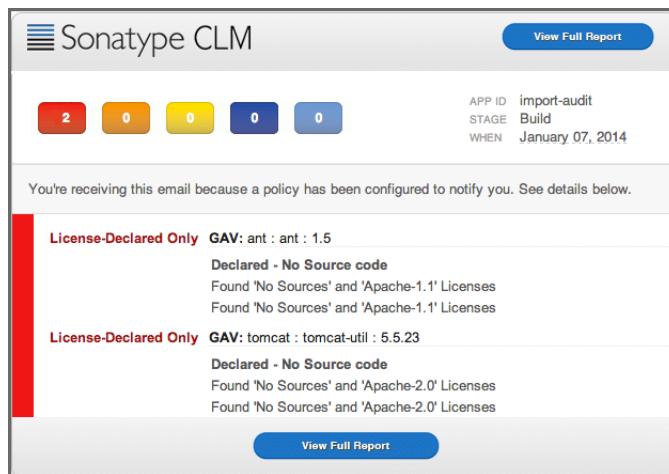


Figure 3.40: Example of a Policy Monitoring Email

Note

Policy Monitoring is not available to customers with a Nexus CLM License. Contact your CLM Admin for additional information.

3.10.1 Setup Policy Monitoring for an Application

The setup for policy monitoring is straightforward. In general you will likely want to avoid monitoring every single policy. Not only is that a lot of policies to monitor, your signal to noise ratio will be off. That is, you might possibly get a lot of notifications for things like old component, or components that are now unpopular.

That's not to discourage you from monitoring these policies, they are important to. However, monitoring, and in turn, the notifications that are associated with monitoring are best reserved for policies that deal

with elements like security vulnerabilities and license issues - that is, those representing a high level of risk.

First, choose an application to monitor

While you can choose any application to monitor, most people start by monitoring an application in production. In many cases production applications have likely been around longer than your implementation of Sonatype CLM. However, you are not prevented from choosing any application to monitor.

1. Log into your Sonatype CLM server with a user account that has proper permissions to make changes to an application policy (at least a member of the owner group for the application would be required).
2. Next, click the *Organizational Design* icon  to access the Organizational Design area.
3. Click *Applications* in the menu on the left, and then click on the application you want to monitor.
4. The **Application Management** area will be displayed.

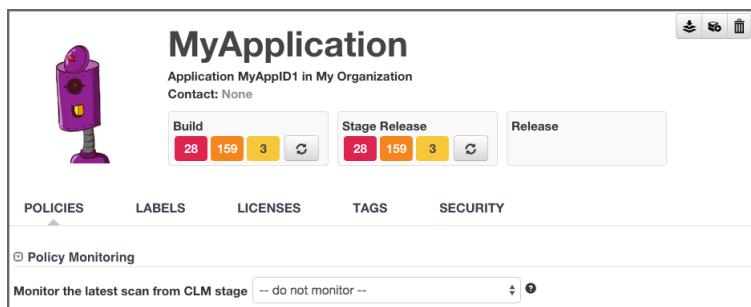


Figure 3.41: Access Application Management Area

Great, now you can move on to picking the stage you want to monitor.

Next, choose a Sonatype CLM Stage to monitor

Each of the Sonatype CLM Stages available for monitoring, are identical to the Sonatype CLM stages displayed when setting policy actions. In general, if you are going to be monitoring a production application, you will want to choose the stage that represents the most recent data. For our example, we'll choose Build, but again, you can choose any stage.

1. First, click on the *Policy Monitoring* section to reveal the options for selecting a stage to monitor.

2. Next, using the drop down menu, select the stage you wish to monitor. You will notice this drop down selection completes the sentence, "*Monitor the latest scan from CLM stage...*"



Figure 3.42: Selecting a Sonatype CLM Stage to Monitor

You are almost there, now all you need to do is add notifications.

Each policy you want to monitor will need to have someone added to the notifications. These are set below the **Actions** section of each policy.

1. From the *Application Management* area, click on the edit button of the policy you want to monitor.
2. Next, just below the **Actions** section, click the *Email* icon to open the Monitoring Notification dialog.
3. Enter an email address manually, and or select any roles you wish to be notified.
4. Click *Done*, and then *Save* to save your edits.



Figure 3.43: Adding Email Recipient

Tip

Remember, you can only edit a policy based on your permissions and where it was created, if you don't see the edit button for a policy, you either need to adjust your permissions, or switch to the organization the policy was inherited from.

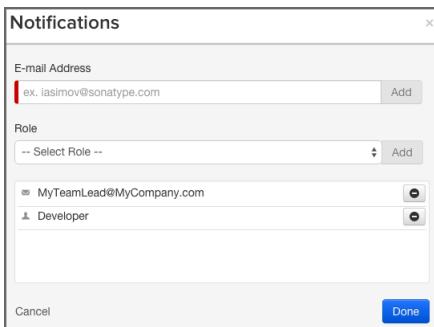


Figure 3.44: Policy Monitoring Notification Example

Congratulations! Your application now has a policy that will be monitored. To monitor more applications and/or policies, simply repeat the steps above.

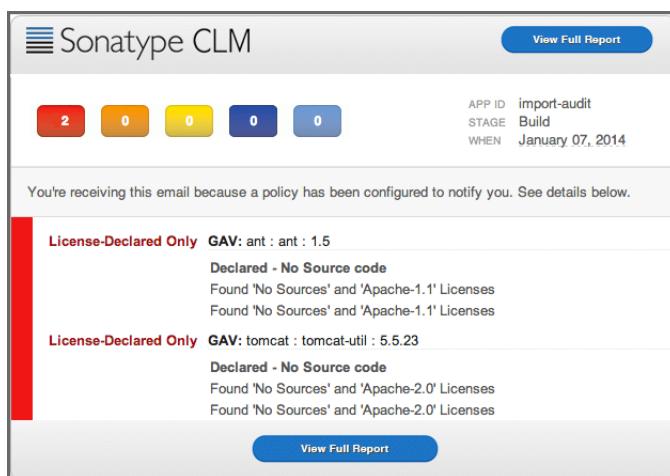


Figure 3.45: Sample Email Notification

Tip

While it is possible to follow these same steps and set policy monitoring at the organization level, you may want to think through that a bit more before blanketing all applications within a particular organization with policy monitoring notifications. In many cases, we find that monitoring is best done on a few, high risk, production applications.

3.10.2 Configuring Notification Times

By default any new notifications for policies that are being monitored will be sent out at 12 AM (per the CLM Server time). If you would like to update this, simply edit your config.yml file for the Sonatype CLM Server. The lines you will need to look for are as follows

```
# Hour of the day(0-23) to schedule Policy Monitoring execution. The  
default is midnight.
```

```
#policyMonitoringHour: 0
```

3.10.3 Summary

At end of this section you should find yourself ready to go out and monitor policy for any application. Remember though, policy monitoring is not the only way to share results, and you should think about which applications, and which policies should be monitored.

Sonatype CLM already provides a number of ways to be notified and informed when a component in one of your applications violates a policy. While you could go and mimic this using the policy monitoring feature, the better practice is to use the policy monitoring notification for only those policies and applications that pose the greatest potential risk. In this, we stress, there's likely nothing worse than getting an email at 3 AM in the morning telling you that a component used by your company's intranet is now violating your architecture age policy. While that's important information, it's not 3 AM - important information.

3.11 Conclusion

Congratulations! Understanding policies is no small feat. While policies can be simple to create, making sure they support your initiatives and goals can be a more difficult task. As we mentioned, it will take some evaluation and modification as you go.

As you have reached the end of this chapter, make sure:

- You understand the difference between applications and organizations.
- You can identify the various parts of a policy.

- You know how to get started with your own governance using the Sonatype sample policies.

The important thing to remember is encourage feedback from your teams. If they are being bogged down by build failures, or dismayed by too many red violations, look at ways you can accommodate these suggestions, and if not be ready to explain the why you've made certain decisions over others.

Chapter 4

Reports in Sonatype CLM

4.1 Introduction

The reports in Sonatype CLM provide a variety of mechanisms to evaluate your application at a particular stage/enforcement point within the component lifecycle as well as determine how your efforts towards improving component usage are going. In the following sections, we will cover the overall usage of the various reports.

4.2 Application Composition Report Overview

The Application Composition Report represents the health of your application. Ultimately, it serves as a snapshot, a point-in-time report representing risk associated with component usage for a specific application. The report includes information on how the application complies with the policies your team, or business, has established. In many ways, it's the final connector between policies and the components of your application.

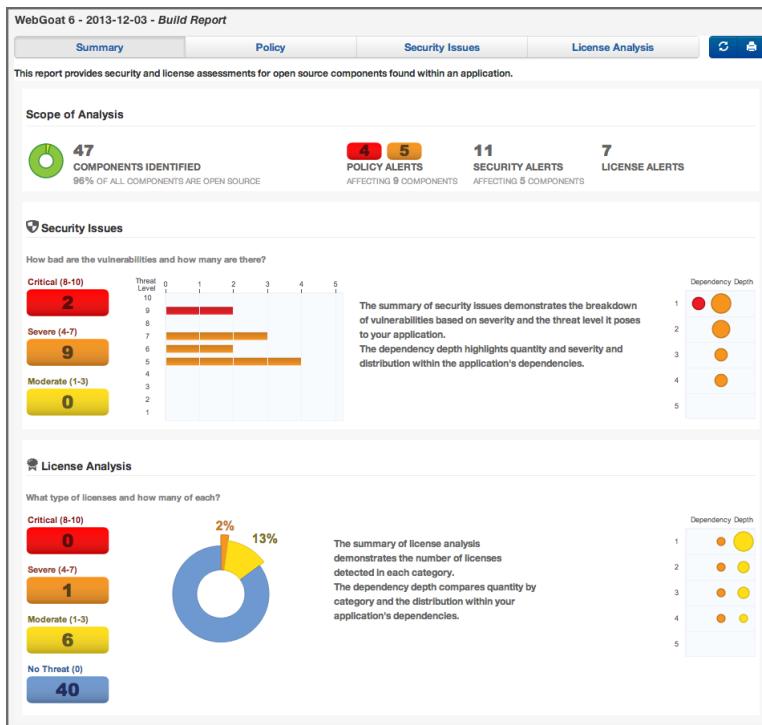


Figure 4.1: Summary Tab of the Application Composition Report

When looking at the report the first time, it can be daunting. If you see tons of red, you may quickly be dismayed. Or perhaps, you don't see enough red and are worried in a different way. These feelings aren't uncommon, and they reveal another important aspect of the Application Composition Report - it contains a lot of information.

More than just reporting the violations components in your application have triggered, it also provides a way to improve policy management. These reports don't show false positives... ever. If there is a red, severe policy violation that should really be much lower, communicate back with the team in charge of managing the policies. In fact, of all its uses, the ability to communicate findings to a wide audience is perhaps the most important task of this report.

In this section, we will provide an overview of the various areas of the report and therefore serve as an robust introduction.

For those of you that prefer bulleted lists, here's what we'll cover in this guide:

- Accessing the application composition report
- Overview of the four tabs and the component list
- Importance of component and violation counts
- Various policy, security, and license related data points
- Printing a bill of materials
- Overview of component information panel (CIP)

This section is meant to provide a detailed look at how to access the application composition report, as well as what information is provided.

4.2.1 Accessing an Application Composition Report

You can access the application composition report in your Sonatype CLM Server in two ways:

Via the Reports Area

When you log into the Sonatype CLM Server the Dashboard is displayed by default. Click the *Reports* icon . If multiple applications have been scanned, you will see all of them here.

Note

You will need to be a member of at least the developer group for the application you wish to see a report for.



Important

Users of Nexus CLM Edition, do not have access to the Sonatype CLM Dashboard. Because of this, these will not be taken to the dashboard after logging in, nor will they see the dashboard icon. Rather, the reports area will display by default.

You will notice, that there are several columns:

Application Name

Links to the **Application Management Area** for the specific application.

Build, Stage Release, and Release Violations

These three columns display the violation counts for the most recent evaluations. The counts are broken down by *Critical*, *Severe*, and *Moderate* with text indicating the time (e.g. 2 minutes ago) of the most recent evaluation.

Contact

This is the contact for the corresponding application.

Organization

Links to the parent organization for the corresponding application.

To access the Application Composition report, click the Violation Summary for the corresponding application and stage.

Application Name ▾	Build Violations	Stage Release Violations	Release Violations	Contact	Organization
 MyApplication	28 159 3 1 minute ago	28 159 3 1 minute ago			My Organization
 My Application 4		6 5 1 month ago			My Organization 3
 My Application 3	6 11 1 5 months ago		6 11 1 1 month ago		My Organization 7
 My Application 2	6 11 1 5 months ago		6 11 1 6 months ago	John Smith	My Organization 4

Figure 4.2: Reporting Area

Tip

By default this view will be sorted alphabetically by the application name. In addition to the filter, you can also click on the application or organization columns to sort alphabetically ascending/descending.

Via the Application Area

The Application area is the same place where you can manage policy for your application, reviewing policies unique to the application, as well as those inherited from the organization. Located just below the application identifier and organization, you will see three columns:

- Build
- Stage Release
- Release

These represent the Sonatype CLM stage where the report was generated for/from. For example, if you use the Sonatype CLM stand-alone scanner and don't specify the CLM Stage, it will default to build. When your scan completes and the report is uploaded, it would appear below *Build*. This is highlighted in Figure 4.3



Figure 4.3: Application Area

Note

Reports can also be accessed via enforcement point tools like Sonatype CLM for CI, and Nexus Pro - Sonatype CLM Edition. However, in each of the tools, they will connect to the Sonatype CLM Server.

4.2.2 Reviewing a Report

When you look at the application composition report for the first time, you will likely notice the four tabs:

- *Summary*
- *Policy*
- *Security Issues*
- *License Analysis*



Figure 4.4: The Four Tabs

These tabs represent the basic navigation for the report, and serve to divide information into specific sections. In a sense, the name of each tab represents the theme of the data that will be displayed.

The *Summary* tab displays a summary of violation, security, and license risk information for components in your application and provides a good first overview. The *Policy* tab displays violation data for components in your application. The *Security Issues* tab displays security related risk for components in your

application. And the *License Analysis* tab displays license-related data for components in your application.

We'll cover each of these in a bit more detail below. However, it's important to first understand a little bit about what a report represents and the basic sets of data it contains.

In general, each report...

- Corresponds to a single, specific application, indicating the application name, date of the report, and the stage the scan took place in.
- Includes components found during a scan of the application, in most cases, including any dependencies.
- Records violations linked to an application's policies, or the policies inherited from the application's organization.
- Displays available security information for any components found matching components in the Central Repository.
- Displays available license information for any components found to exactly, or partially, match components in the Central Repository, as well as any data recorded manually (e.g. through the claiming process).
- Distinguishes between, external, proprietary and internally identified/claimed components.

Now that you know what forms the basis of the report, let's take a look at each tab individually.

4.2.3 Summary Tab

The *Summary* tab is always the first section of the report displayed. It is broken into three sections:

Scope of Analysis

This section shows counts, giving you an idea of the volume of components that were found during the scan. It also gives a breakdown of those that were identified, including a specific percentage that is represented by open source components. In addition to these numbers, you will also see:

- A count of components with policy violations, displayed by threat level. Only the most severe violation for each component is counted.
- The total number of security alerts found, and the number of affected components.

- The total number of license alerts. Each license alert corresponds to a single component.

Security Issues

The Security Issues section provides three visualizations. The first visualization displays the number of security issues by their particular Common Vulnerability Scoring System CVSS score, breaking the issues into three threat levels - *Critical*, *Severe* and *Moderate*.

Next to this raw count, the same numbers are represented in a bar graph to help distinguish the relative impact for each threat level.

Finally, a dependency depth chart shows where the security issues occur, relative to how many there are, indicated by the size of the circles, as well as what level of dependency they are found in.

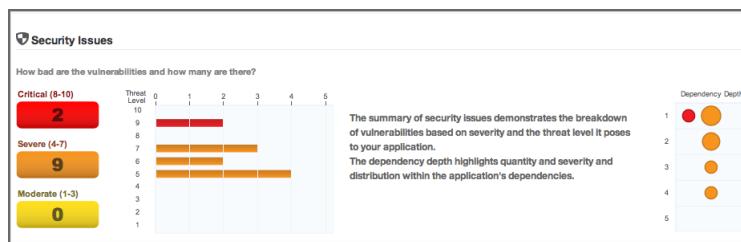


Figure 4.5: Security Issues Summary

License Analysis

As with *Security*, the *License Analysis* section breaks the data into four threat level categories. However, these threat levels do not come from an external source, but rather the user-configurable license threat groups that are managed via the CLM Server.

There are four threat level categories:

- Critical (Copyleft)
- Severe (Non Standard)
- Moderate (Weak Copyleft)
- No Threat (Liberal)

These categories used in the report are static and not not configurable.

The first counts that are displayed represent the total number of licenses found in each threat level. Next to this list, a graph indicates percentage of licenses in each threat level category, compared to the total number of licenses found. Finally, a dependency depth chart indicates the volume of licenses found at each dependency level, as well as the color corresponding to the threat level.

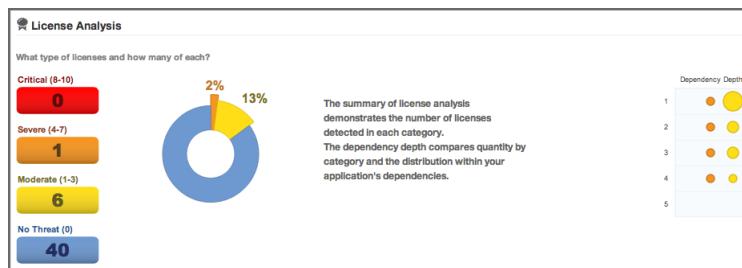


Figure 4.6: License Analysis Summary

4.2.4 Policy Tab

The *Policy* tab displays a list of all components found during the scan of the application. By default components are ordered by their worst policy violation. This is an important distinction, because a component may have more than one violation, and the threat level severity for those violations could vary. If you wish to see all violations there are two options, using the Violation Filter, or the Component Information Panel (CIP). In this guide we'll discuss both options. However, below we have highlighted the available filters.

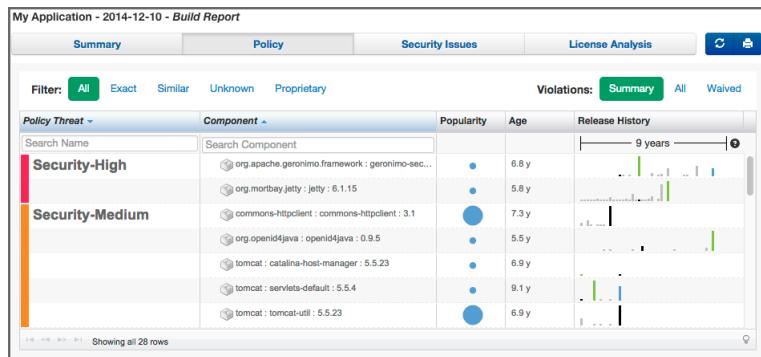


Figure 4.7: Policy Tab

Filter

The filter lists five categories:

- All (*default*)
- Exact
- Similar
- Unknown
- Proprietary

In addition to the main set of filters, you can also filter by violations, including those that have been waived. The available options include:

- Summary (*default*)
- All
- Waived

Clicking on any of these will change the components in the list. We'll discuss each of these in further detail in the sections corresponding to [component matching](#), [claiming components](#), and [waiving components](#) sections.

Component List

The list of components, below the filter, displays the *Threat level* posed by the components. The

The *Policy Threat* column displays the name of the worst violated policy for the component and the severity using a colored bar. The *Component* column displays all available coordinate information for the component.

In addition the list displays the *Popularity* and the *Age* of the component in the Central Repository in separate columns. The *Release History* is displayed in a visualization that includes the most popular version, the most recent version, your version and any other available versions in a timeline.

By clicking on the column header, the list of components can be sorted. If you are looking for a specific policy, or component, you can use the search fields located at the top of each of those columns, directly below the header.

Clicking on a row for a component in list displays the Component Information Panel (CIP), which we will discuss in Section 4.2.8.

4.2.5 Security Issues Tab

The important thing to remember about the *Security Issues* tab is that information displayed there is related specifically to security vulnerabilities data that has been collected by Sonatype. This data however, is separate from policy violations, which are based on policies that you have created (or imported), and are displayed on the *Policy* tab. That is, you could certainly have a situation where there is a security vulnerability, and no policy violation. Because of this, it is important to treat them independently.

My Application - 2015-05-13 - Build Report				
Summary	Policy	Security Issues	License Analysis	
Threat Level	Problem Code	Component	Status	
9	CVE-2007-4575	hsqldb : hsqldb : 1.8.0.7	Open	
	OSVDB-40548	hsqldb : hsqldb : 1.8.0.7	Open	
7	CVE-2015-0254	jstl : jstl : 1.2	Open	
	OSVDB-111268	il.nudin.mavenjs : mavenjs-test-war : jar : exec-war : 2.0.1	Open	
	CVE-2015-0254	taglibs : standard : 1.1.2	Open	
	CVE-2013-2186	commons-fileupload : commons-fileupload : 1.2.2	Open	
	OSVDB-98703	commons-fileupload : commons-fileupload : 1.2.2	Open	
6	CVE-2013-6429	org.springframework : spring-web : 3.2.4.RELEASE	Open	

Figure 4.8: Security Issues Tab

The way components are displayed is actually quite different as well. In the *Security Issues* tab, only those components with a security vulnerability are displayed. The data provided for each component is broken into several columns:

- Threat Level
- Problem Code
- Component
- Status

By default the list of components with security vulnerabilities is organized by threat level. This helps you isolate the most critical issues you need to address. However, you may notice that components in this list are repeated. This is because a component may have more than one security vulnerability, and those vulnerabilities in fact may have different scores, thus different threat levels.

To sort the list, simply click the corresponding header. For example, if we wanted to sort by components, finding a component with multiple vulnerabilities, we would simply click on the *Components* column. Additionally, you can search for a specific component by typing in the search field located directly below each header.

4.2.6 License Analysis Tab

The *License Analysis* tab displays all identified components found in the application scan and their license threat details. Unknown components are not displayed. Similar to the security issues, a license threat does not necessarily correlate to a policy, and as such should be treated independently.

The screenshot shows a table titled "My Application - 2015-05-13 - Build Report" with four tabs at the top: Summary, Policy, Security Issues, and License Analysis. The License Analysis tab is active. The table has three columns: License Threat, Component, and Status. The License Threat column lists various license categories. The Component column lists the names of the identified components. The Status column shows that all listed components are currently open. A search bar is visible above the table.

My Application - 2015-05-13 - Build Report		
Summary	Policy	Security Issues
License Threat	Component	Status
Search Licenses	Search Component	Search Status
Apache-2.0, Non-Standard	com.fasterxml.jackson.core:jackson-core:2.0.4	Open
Apache-2.0 or LGPL-2.1, Non-Standard	com.fasterxml.jackson.core:jackson-databind:2.0.4	Open
Not Declared, CDDL-1.0	javax.transaction:jta:1.1	Open
CDDL-1.0 or GPL-2.0-CPE, CDDL-1.1 or GPL-2.0-OF	javamail:mail:1.4.2	Open
CDDL-1.0	jsr311:jstl:1.2	Open
CDDL-1.0	javatime.activation:activation:1.1	Open
LGPL-3.0, LGPL-2.1+, MIT	net.sourceforge.jtds:jtds:1.2.2	Open
CPL-1.0, No Source License	junit:junit:4.8.1	Open

Figure 4.9: License Analysis Tab

For each component listed, the license related data is displayed. This data is based on information collected during a scan. By default, components are listed based on the threat of the corresponding *License*

Threat Group that identified license is in. However, like the other tabs, clicking on a column in list will sort the components by that column. Additionally, specific components can be isolated using the search located below each header. The columns displayed include:

- License Threat
- Component
- Status

4.2.7 Printing and Reevaluating the Report

The top right corner of the report displays two buttons that give you access to refreshing the report as well as printing the report.

The refresh button on the left triggers a re-evaluation of the report. It will take the existing list of components in the report and reevaluate them against the your application policy. This comes in handy when you are making policy changes and want to see how that would affect the current data without having to rerun a build.

The second icon on the right, the printer icon, allows you to create a PDF version of the report that is nearly identical to the HTML version. You can use this report for actual printing on paper, distribution to recipients without access to the CLM server or simply for archival purposes. And of course it also works as a great bill of materials for your application.

While these are both small elements, they can prove to be very useful.



Figure 4.10: Application Composition Report Buttons For Printing and Reevaluation

4.2.8 The Component Information Panel (CIP)

In our previous sections, we briefly indicated that clicking on a specific component causes the Component Information Panel (CIP) to be displayed. We promised to discuss it further, and this section makes good on that promise.

The first thing you should notice, is that the CIP can be accessed for a component on the *Policy*, *Security Issues*, and *License Analysis* tabs. No matter which of these tabs you are on, simply click on the component, and the panel is displayed. Even better, the information displayed is the same, regardless of the tab in which you clicked on the component.

The CIP itself is divided into two areas. The top has a list of various sections, each providing more specific details and functionality related to the component. Below these sections, the panel will display information for the corresponding section. A brief description of each section is included below

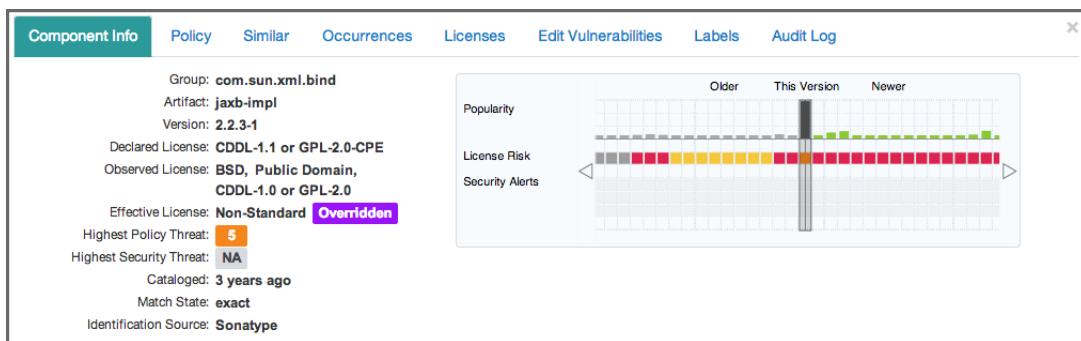


Figure 4.11: Component Information Panel CIP Example

COMPONENT INFO

Declared License

Any license that has been declared by the author.

Observed License

Any license(s) found during the scan of the component's source code.

Effective License

Either any licenses included in the Declared or Observed Group, or the overridden license.

Coordinates

The identifying information for a component. For known components, all available coordinate information will be displayed.

Highest Policy Threat

The highest threat level policy that has been violated, as well as the total number of violations.

Highest Security Threat

The highest threat level security issue and the total number of security issues.

Cataloged

The age of the component based on when it first was uploaded to the Central Repository.

Match State

How the component was matched (exact, similar, or unknown).

Identification Source

Whether a component is identified by Sonatype, or claimed during your own process.

Website

If available, an information icon providing a link to the project is displayed.

The graph itself is laid out like a grid, with each vertical piece representing a particular version. The selected version being identified by a vertical line. The information displayed in the graph includes:

Popularity

The popularity for each version is shown as a bar graph. the larger the graph the more popular the version.

License Risk

This will display the license risk based on the application that is selected, and the associated policy and/or license threat groups for that application. Use the application selector to change the application, and corresponding policies the component should be evaluated against.

Security Alerts

For each version, the highest security threat will be displayed by color, with the highest shown as red, and no marker indicating no threat.

Policy

The *Policy* section displayed in Figure 4.12 has the details of any policy violations for the component. Here you can see the name of the policy that has been violated (and any action that was taken), the name of the constraint that has been violated, and the value that was found. While the *Policy/Action* and *Constraint* names are straight forward, the *Condition Value* may be a little confusing at first.

As we know from our other guides, a condition is simply the *if* part of an *if/then* statement. *If* a certain condition value is found which is equivalent to a condition being met, *then* the policy will be violated. E.g. if we have a policy that has a condition such that if a security vulnerability is found, our Condition Value column would indicate, *Found x Security Vulnerabilities*. In the same regard, *Constraints* are simply multiple conditions joined together.

The screenshot shows the 'Policy' tab of the Sonatype CLM Component Information Page (CIP). The top navigation bar includes tabs for 'Component Info', 'Policy' (which is selected and highlighted in blue), 'Similar', 'Occurrences', 'Licenses', 'Edit Vulnerabilities', 'Labels', and 'Audit Log'. A button labeled 'View Existing Waivers' is located in the top right corner. The main content area displays three policy violations:

Policy/Action	Constraint	Condition Value	Waivers
Security-Medium	CVSS >=4 and <7	Found 3 Security Vulnerabilities with Severity >= 4 Found 3 Security Vulnerabilities with Severity < 7 Found 3 Security Vulnerabilities with Status OPEN	<button>Waive</button>
License-Observed Only	Not Declared but Observed	Found 'Apache-1.1' and 'Apache-2.0' and 'Not Declared' Licenses Found 'Liberal' License Threat Group	<button>Waive</button>
Architecture-Quality	Unpopular Old	Relative Popularity was 1% Component does not contain proprietary packages Age was 8 years and 24 days	<button>Waive</button>

Figure 4.12: CIP, Policy Section

In addition to simply viewing the policy information details, a policy violation can also be waived in this section of the CIP using the *Waive* button.

Similar

You likely have already noticed the *Similar* filter that is available on the *Policy* tab. These two are related, and both are a function of the matching algorithms that Sonatype CLM uses when scanning and identifying components. We won't go into the details of matching at this time. So, for now, know that any components found to be similar to the selected component will be listed in the *Similar* section displayed in Figure 4.13. A similar component could for example be a component that a developer has built locally using the source code of an open source component with minor modifications or additions.

The screenshot shows the 'Similar' tab of the Sonatype CLM CIP. The top navigation bar includes tabs for 'Component Info', 'Policy', 'Similar' (which is selected and highlighted in blue), 'Occurrences', 'Licenses', 'Edit Vulnerabilities', 'Labels', 'Claim Component', and 'Audit Log'. The main content area displays a table with one row of data:

License Threat	Security	Component
Apache-2.0, Apache		commons-httpclient : commons-httpclient : 3.1

Figure 4.13: CIP, Similar Section

Occurrences

When a file is scanned, it has a filename and location where it was found. In some cases, it may have more than one filename and location. Either way, the path to the location(s), as well as the filename(s), of the component that was scanned is included in this section. In short, the *Occurrences* section displayed in Figure 4.14 lists the file names and locations where the component was encountered. This section can be especially useful to detect accidental shipping of duplicate components archives or a misconfiguration of your actual report creation target e.g. you might be scanning the deployment archive (e.g. a war file) as well as the build output folder used to create the archive.

The screenshot shows a software interface titled 'Occurrences'. At the top, there is a navigation bar with tabs: 'Component Info', 'Policy', 'Similar', 'Occurrences' (which is highlighted in blue), 'Licenses', 'Edit Vulnerabilities', 'Labels', and 'Audit Log'. Below the navigation bar, the main content area displays a list of occurrences. The first item in the list is 'Dependency axis:axis:jar:1.2 located at Module WebGoat:WebGoat:war:6.0'. Below this, there are three entries for 'axis-1.2.jar': 'located at target/WebGoat-6.0.war/WEB-INF/lib', 'located at target/WebGoat-6.0/WEB-INF/lib', and 'located at target/nexus-staging/771ca8d459470/WebGoat/WebGoat/6.0/WebGoat-6.0.war/WEB-INF/lib'. The background of the interface is white, and the text is primarily black or blue.

Figure 4.14: CIP, Occurrences Section

Licenses

The *Licenses* section displayed in Figure 4.15 is split into two areas. On the left, any licenses that were identified as declared by the author of the component, as well as any license found during the scan of the component source code are listed. On the right, is the license status area. This functionality directly correlates to the blue *Edit* button we mentioned in the *License Analysis* tab overview. It allows you to set the *Status* of the component license information.

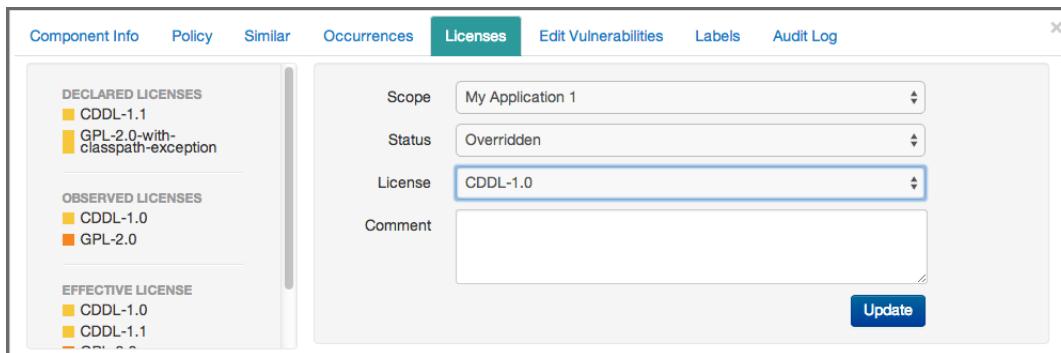


Figure 4.15: CIP, Licenses Section

Edit Vulnerabilities

In much the same way as the *Licenses* section, *Edit Vulnerabilities* displayed in Figure 4.16 is separated into two areas. On the left, all security vulnerabilities related to the component are displayed. On the right, the security vulnerability status area. This functionality, which we will discuss later, directly correlates to the blue *Edit* button we mentioned in the *Security Issues* tab.

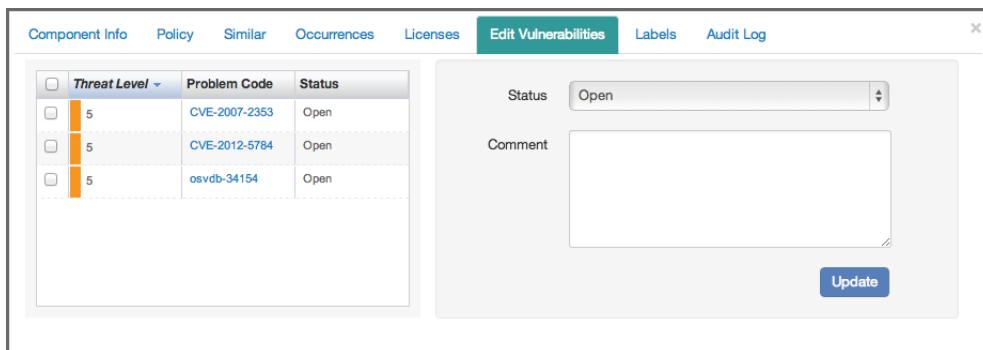


Figure 4.16: CIP, Edit Vulnerabilities Section

Labels

Labels are discussed in more depth later in this guide. However, the important item to note here, is that the assignment of labels to a components is done in this section of the CIP displayed in Figure 4.17.

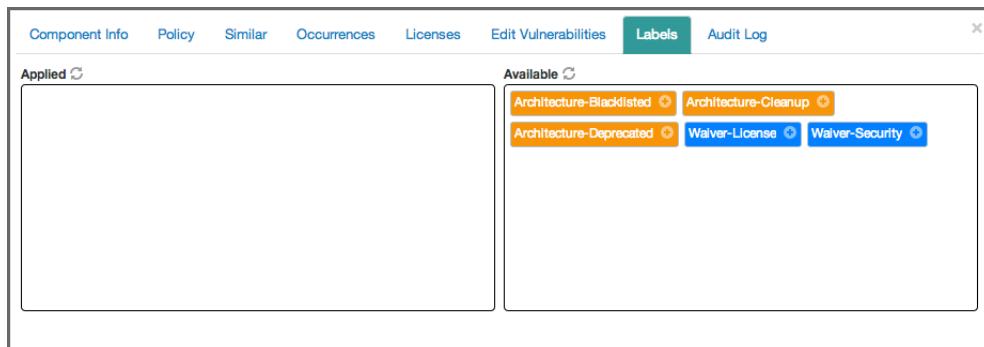


Figure 4.17: CIP, Labels Section

Claiming Components

The Claim Component section displayed in Figure 4.18 is only available for unknown or similar component matches. During a scan, some components are identified as unknown or similar to components known by Sonatype CLM. Since we realize that in many cases, you actually recognize these components, we provide this section to claim these components.

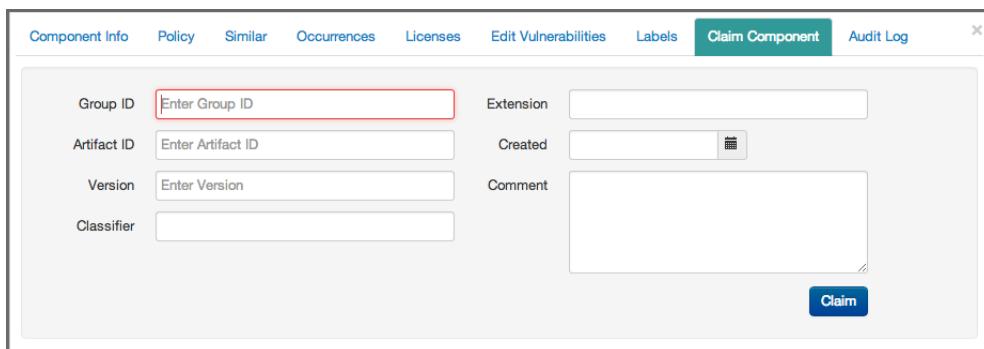


Figure 4.18: CIP, Claim Component

Audit Log

When changes are made to the status of a security vulnerability, or the status of a component's license within the scope of a particular application, that information is recorded in the *Audit Log* section of the CIP for that component displayed in Figure 4.19. As is the case for these last few sections, we'll discuss

the *Audit Log* in greater detail along with our upcoming discussion of *Security Vulnerability* and *License Analysis* status.

Component Info	Policy	Similar	Occurrences	Licenses	Edit Vulnerabilities	Labels	Audit Log	X
Date	User	Action	Detail	Comment				
Dec 3 2013, 2:20:58 pm	anonymous	Acknowledged	License Analysis	Starting research, updated status.				

Figure 4.19: CIP, Audit

4.2.9 Summary

This overview showed you a basic introduction to what the *Application Composition Report* provides. While it's not meant to be an exhaustive description, there are a number of items you should take with you.

The four tabs of the application composition report represent the basic separation of data. You learned about:

- High level overview of four tabs.
- Significance of summary counts.
- Independence of policy, security, and license data.
- Sorting of the components lists
- Searching for specific components.
- Printing a bill of materials.
- Accessing the component information panel CIP
- Overview of CIP sections

4.3 Resolving Security Issues

Perhaps one of the most disconcerting experiences with Sonatype CLM, is scanning your application for the first time, and seeing a huge number of critical security vulnerabilities indicated on the *Summary* tab. It can be a sobering experience, and in some ways it should be a little worrisome. More importantly though, it should create motivation for further investigation.

The key word there being investigation. That's because even though we've provided accurate data, you still need to have a process to review all available data, and then track your progress. It is not completely uncommon, and quite possible that a vulnerability doesn't apply to your application or, at the very least, isn't a concern given the particular application you are developing, and it's relative exposure points. Where do you start your investigation though?

4.3.1 Security Issues

The component list on the *Security Issues* tab (see example displayed in Figure 4.20) only shows components that have a security vulnerability. In addition, when a component has multiple security vulnerabilities, it is displayed multiple times.

There are a total of four columns: *Threat Level*, *Problem Code*, *Component*, and *Status*. Initially the list of vulnerabilities is ordered by the *Threat Level* column. However, you can sort the list by any other column by simply clicking on a header.

While the *Threat Level* and *Component* columns should be self-explanatory, the two other columns, *Problem Code* and *Status*, deserve a bit more explanation.

My Application - 2015-05-13 - Build Report									
Summary		Policy		Security Issues	License Analysis				
Threat Level	Problem Code	Component	Status						
Search Level	Search Code	Search Component	Search Status						
9	CVE-2007-4575	hsqldb : hsqldb : 1.8.0.7	Open						
	OSVDB-40548	hsqldb : hsqldb : 1.8.0.7	Open						
	CVE-2015-0254	jstl : jstl : 1.2	Open						
	OSVDB-111266	li.rudin.mavenjs : mavenjs-test-war : jar : exec-war : 2.0.1	Open						
	CVE-2015-0254	taglibs : standard : 1.1.2	Open						
	CVE-2013-2186	commons-fileupload : commons-fileupload : 1.2.2	Open						
	OSVDB-98703	commons-fileupload : commons-fileupload : 1.2.2	Open						
	CVE-2013-6429	org.springframework : spring-web : 3.2.4.RELEASE	Open						

Showing all 42 rows

Figure 4.20: Security Issues Tab

Problem Code

The *Problem Code* column provides a link to available details for the security vulnerability on the CVE and OSVDB web sites. This information is provided via the CVE and OSVDB security information sites, and is managed independently of Sonatype CLM data. These public security databases allow you to get quick information about the security issue and nature of the vulnerability.

Status

The *Status* column allows you to track the state and progress of research of the effect of a security vulnerability with respect to your application. We'll focus on the *Status* column in a bit more detail when we cover the CIP. A key point to remember, is that as long as the status is set to *Open*, *Acknowledged*, or *Confirmed*, the vulnerability will be included in the counts on the summary page. In addition, a policy with a condition related to the presence of a security vulnerability will be met, as long as the status is set to *Open*. That means it's very important to research these issues, so that only those affecting your application remain.

4.3.2 The Component Information Panel (CIP)

To access the CIP as displayed in Figure 4.21, simply click on a component row in the list. There are three sections you should use during your security vulnerability investigation - *Component Info*, *Edit Vulnerabilities*, and *Audit Log*.

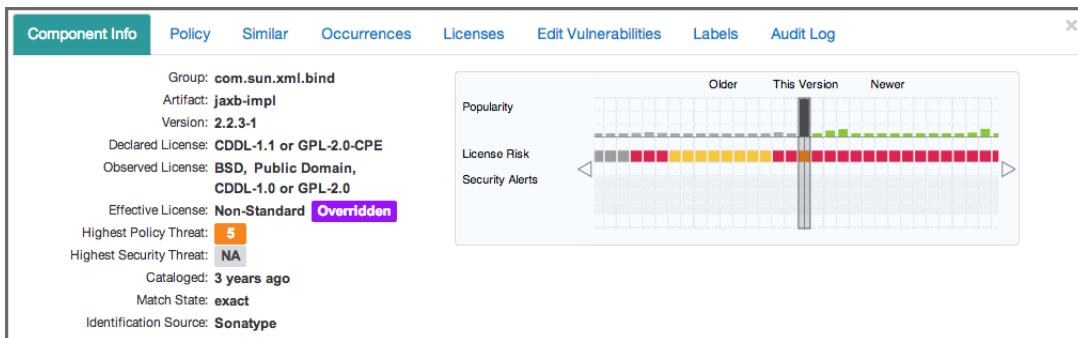


Figure 4.21: Component Information Panel (CIP)

Component Info

One of the first things you should notice in the *Component Info* section, is the *Highest Security Threat*. This field, located on the left side of the panel, displays the highest threat and the threat value (on a scale of 1-9). In addition, it will display the total number of security issues for that particular component.

Component Graph

Next, you should take a close look at the graph to the right of the panel. On the graph, locate the *Security Alerts* field, taking into consideration the other fields as well. This graph will display security vulnerabilities by version, with the current version identified as *This Version*. In some cases there are clear points where security issues have been resolved, as can be seen above. Often this tends to coincide with more popular version, although, that is not necessarily always the case.

4.3.3 Editing Vulnerability Status

After clicking on a component row to display the CIP, click the *Edit Vulnerabilities* section.

Here, the left side will display all security vulnerabilities. Depending on how many, this list may scroll. The list is then organized into three columns:

Threat Level

Indicates the threat assigned to the security vulnerability and is determined based on the source. This is **not** associated to any policy threat level.

Problem Code

This is the unique identifier of the security issue as assigned by the source (e.g. CVE-2000-5518). It will change depending on the source of the data.

Information

Sonatype provides information from public sources, as well as information from our own research team. Clicking on the icon in the corresponding row will display additional details provided about the issue.

+



Figure 4.22: Security Information Modal

Status

The status of the security issue as assigned by the drop down to the right. See below for information on changing this status.

To the right of the list of security vulnerabilities is the status drop down and a comments section. To change the status simply select one from the drop down, select the vulnerabilities the status will apply to, enter any associated comments, and finally, click the *Update* button. It is important to mention the status can be changed to any status at any time.

There are four statuses available:

Open

The default status, represents no research being done.

Acknowledged

Represents that the security vulnerability is under review.

Not Applicable

Indicates that research was conducted, and the particular vulnerability does not affect the application.

Confirmed

Demonstrates research was conducted, and it has been determined the security vulnerability is valid and applicable.

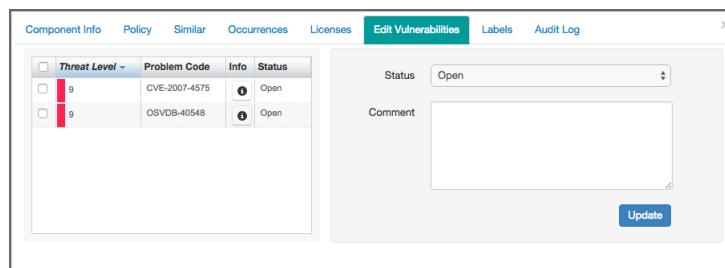


Figure 4.23: Editing Vulnerabilities

4.3.4 Matching to Violations

In some cases, just because there is a security vulnerability, that does not necessarily mean there is a corresponding policy violation. For this reason, it's important to refer back to your *Policy* tab as well. If you are finding that critical security issues you are troubleshooting do not show up as a policy violation as well, you may need to refine your policy so that future security issue trigger a policy violation and thus ensure that they get your attention.



Figure 4.24: Example of Component with Security Issue, but No Policy Violation

4.3.5 Summary

Security issues can be scary, there is really no way to deny that. However, as with all things, fear can be leveled by knowledge and understanding. The more you know, the more you will understand and the less you will fear. So, here is what you should have picked up from our section on *Security Issues*:

- Accessing the *Security Issues* tab.
- Reviewing security vulnerabilities and the threat.
- Changing the status of a security issue.

4.4 License Analysis Tab

In some cases, the licenses of a component is the last thing a development team will think about. This could simply be due to a misunderstanding of *open source*, or a situation where it's nearly impossible to do the exhaustive research needed to determine the license for a given component, especially dependencies. With Sonatype CLM this problem is a thing of the past.

Even if you haven't built policies around licenses the *License Analysis* tab provides license information about every component found in during a scan of your application.

This license information is provided via data collected from the Central Repository, as well as research conducted by Sonatype. In addition to the license information for each component, we'll also assess a threat of each license, based on a set of default *License Threat Groups*. As with *Security Issues*, the best place to start is with the component list in the *License Analysis* tab, and then move into looking at additional details for individual components, making any license status changes as you see fit.

The screenshot shows the 'License Analysis' tab of the Sonatype CLM interface. The title bar says 'My Application - 2015-05-13 - Build Report'. Below it is a navigation bar with tabs: 'Summary', 'Policy', 'Security Issues', and 'License Analysis' (which is selected). There are also icons for search and print.

The main area is a table titled 'License Threat'. It has three columns: 'License Threat', 'Component', and 'Status'. The 'License Threat' column uses color-coded boxes to indicate severity: red for Copyleft, orange for Non Standard, yellow for Weak Copyleft, and blue for Liberal. The table lists various licenses found in components like com.fasterxml.jackson.core:jackson-core, com.fasterxml.jackson.core:jackson-databind, javax.transaction:jta, javax.mail:mail, jstl:jstl, javax.activation:activation, net.sourceforge.jtds:jtds, and junit:junit. All listed items have an 'Open' status.

License Threat	Component	Status
Apache-2.0, Non-Standard	com.fasterxml.jackson.core : jackson-core : 2.0.4	Open
Apache-2.0 or LGPL-2.1, Non-Standard	com.fasterxml.jackson.core : jackson-databind : 2.0.4	Open
Not Declared, CDDL-1.0	javax.transaction : jta : 1.1	Open
CDDL-1.0 or GPL-2.0-CPE, CDDL-1.1 or GPL-2.0-CF	javax.mail : mail : 1.4.2	Open
CDDL-1.0	jstl : jstl : 1.2	Open
CDDL-1.0	javax.activation : activation : 1.1	Open
GPL-3.0, LGPL-2.1+, MIT	net.sourceforge.jtds : jtds : 1.2.2	Open
CPL-1.0, No Source License	junit : junit : 4.8.1	Open

At the bottom of the table, it says 'Showing all 45 rows'.

Figure 4.25: License Analysis Tab

4.4.1 License Threat Group

Before going into the details of information displayed in the *License Analysis* section for the application composition report, it is best to establish a clear understanding of license threat groups.

License threat groups are essentially a set of groups of similar licenses, each with a corresponding threat severity (red, orange, yellow, and blue). Licenses are placed into these groups, and when a component is found to have this license, it is flagged to the corresponding threat group. This is then conveyed in the Sonatype CLM Server in multiple areas, including the *Summary* tab and the *License Analysis* tab.

A default set of license threat groups are provided when you install Sonatype CLM for the first time. Additional license threat groups can be imported with our sample policies or manually created. In both cases, these can be changed and managed in the Sonatype CLM server.

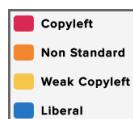


Figure 4.26: The Default License Threat Groups

Tip

How you manage your license threat groups directly impacts how threat is translated in the reports.

4.4.2 License Analysis

The component list on the *License Analysis* tab is more similar to the list on the *Policy* tab, because it is a list of all components, not just those that have a license issue.

The list itself includes columns for *License Threat*, *Component*, and *Status* of the license issue. Clicking on the column provides sorting, while specific items can be searched using the field just below the column heading.

License Threat

The list of components is ordered by license threat which is based on the threats assigned to the license threat groups. Though a single component may actually have several licenses, license threat will only show the highest threat. This threat, as we mentioned earlier, is based on four default categories, which correspond to four default license threat groups of the same name.

- Critical
- Severe
- Moderate
- No Threat

Status

License status, like status for security vulnerabilities, allows you to track the process for license related research. In addition it provides a way to override a license in situation where you believe the license to be incorrect, or there is an option to choose a specific license. We'll discuss that process a little bit further down.

4.4.3 The Component Information Panel (CIP)

To access the CIP for a component on the *License Analysis* tab, simply click on the component row. It will expand providing details in a number of sections. You will likely notice this looks the same as other CIP panels when clicking on other tabs of the application composition report, and you would be correct. There is nothing additional provided by accessing the CIP via the *License Analysis* tab of the report. However,

for this section, we want to focus on the license related information in the Component Info section, as well as the entire *Edit Licenses* and *Audit* sections.

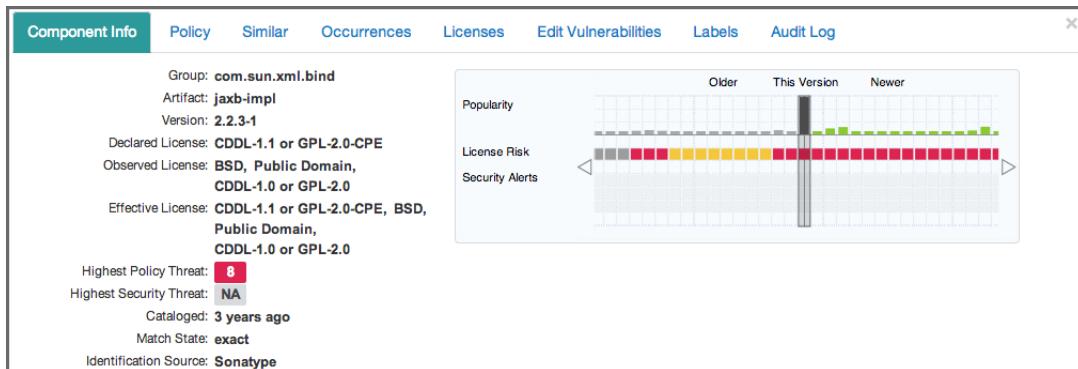


Figure 4.27: Component Information Panel (CIP)

Component Info

Again, the information contained here would be the same, whether or not you clicked on the component in the *License Analysis* tab. However, this gives us the context to talk about the License related fields in this section.

License Identification Types

On the left side of the Component Info section, you should pay attention to three fields, which are described below.

Declared License

these are the licenses that the developer of the component has identified.

Observed License

these are the licenses that have been observed during Sonatype's research.

Effective License

The effective license displays license information based on one of two scenarios. In cases where multiple licenses are found, including any that are observed, these will all be included as effective. If a license is selected, or overridden, then that license will be considered effective, and listed here.

License Identification Values

In cases where there is no declared and/or observed licenses, a message will be displayed. There are several options, each with specific meaning:

No Source License

sources were provided, but there was no license data found.

No Sources

indicates we have no sources for the component.

Not Declared

indicates nothing was declared by the author/developer.

Not Provided

will appear when the license is actually null, and is unique to claimed components, but might also happen while new components are being processed by Sonatype.

Component Graph

The graph itself is laid out like a grid, with each vertical piece representing a particular version. The selected version being identified by a vertical line.

While the information displayed in the graph includes popularity, and security information, right now, just take a look at License Risk. This will display the license risk based on the application that is selected, and the associated policy and/or license threat groups for that application. Use the application selector to change the application, and corresponding policies the component should be evaluated against.

4.4.4 Editing License Status and Information

Editing a license can be used for different purposes. One addresses the workflow of your research into a license related issue, while the other allows you to completely override a license all together. We'll cover all this below, but first let's take a look at the information displayed.

After clicking on a component in the list, and then the *Licenses* section of the CIP, the left side of the CIP displays the license(s) declared by the developer of the component, those that have been observed, and what is considered effective (a combination of the previous two). That is, unless they have been manually overridden or a specific license has been selected.

Next to each of these licenses is a box, displaying the severity of the license. This list can get long, so you may have to scroll to see all the licenses. Then, to the right of the license list, there are four drop down lists.

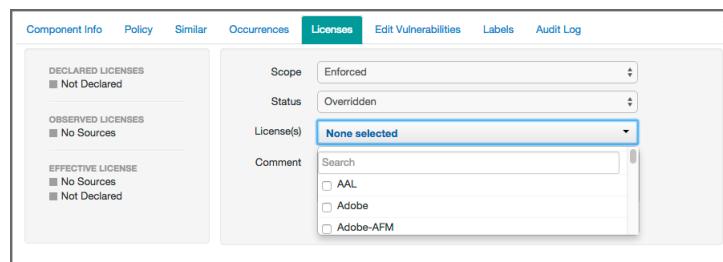


Figure 4.28: Editing License Using the Select Option

Scope

Scope allows you to apply the license status to this component by choosing application or to all components attached to the current application's organization by choosing organization.

Status

As we mentioned previously, *Status* provides a way to track your research, override a license, or select from an option. The available options are included below.

Open

This is default status, and will be included in the count of license issues.

Acknowledged

Acknowledged indicates the issue is being researched, and will still be included in the count of license issues.

Overridden

This status will allow you to select one or more licenses from the *License(s)* dropdown (located just below the *Status* dropdown). This will override any licenses that have been declared or observed.

Selected

In cases where there are multiple licenses, this option will populate the *License(s)* dropdown with any licenses found in the component, declared or observed. Multiple licenses can be selected.

Confirmed

Confirmed simply indicates that the license(s) found are indeed correct, and will be included in any count of license issues.

License(s)

The *License(s)* drop down only displays given that a status of selected or confirmed has been chosen. Given that it will present either a list of all licenses (if override is chosen) or only the declared and observed licenses (if selected is chosen). The license that is chosen will be displayed in the *Effective License* field in the *Component Info* section of the CIP. In addition, any overridden/selected license will be indicated with a label of same name, next to the license in this field.

Comment

A comment is not required, but is a good element to include whenever you are making changes to the *License Status*. This is because it provides a way to understand, as well as audit, the decisions made to change a license status. This comment will be included with the record in the *Audit Log* section of the CIP.

Once you have made all your selections, and entered any necessary comments, click the *Update* button to save the *License Status* change.

4.4.5 Summary

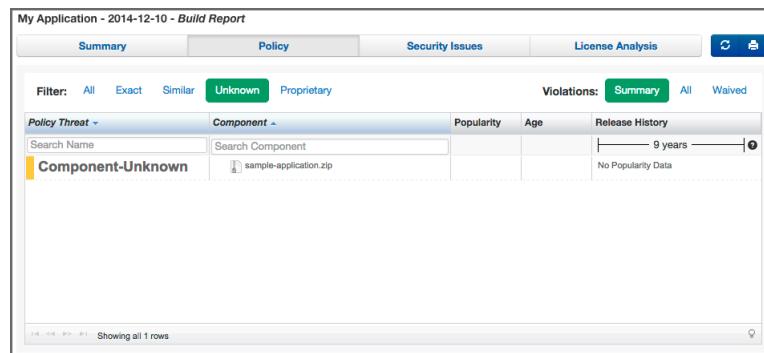
So, we covered quite a bit there, and we didn't even get into explaining the differences between licenses. Though, that's something better afforded by your own legal council, or at least reviewing a vast amount

of resources on the web. For this section here's what you should have learned:

- Accessing the *License Analysis* tab.
- Reviewing license threat.
- Changing the status of a license issue.
- Overriding or selecting a license.

4.5 Component Identification

One of the most important things you can do with regards to understanding the components in your application, is to identify them. What remains unidentified is of obvious concern.



The screenshot shows a 'Build Report' interface for 'My Application - 2014-12-10'. The 'Policy' tab is selected. A search bar at the top has 'sample-application.zip' entered. Below it, a table lists one component: 'Component-Unknown' with a yellow warning icon. The table columns are 'Policy Threat', 'Component', 'Popularity', 'Age', and 'Release History'. The 'Release History' column shows '9 years' and 'No Popularity Data'. The bottom of the table says 'Showing all 1 rows'.

Figure 4.29: Unknown Component

Sonatype CLM allows you to identify components in a number of ways, including:

- Extensive matching via Sonatype CLM algorithms
- Claiming components
- Establishing proprietary components

In this section, we'll describe all of these in detail, within the context of identifying components using the application composition report, as well as offer our suggestion for best practices.

4.5.1 Matching Components

When a Sonatype CLM analysis is performed, hashes of the components in your application are created. This in many ways is like a fingerprint, which is unique to a component. We then compare that fingerprint (hash), back to our database of components. This database includes general component info, usage statistics, security vulnerability, and license information.

All of this information can be used as parameters in your policy, which translates to more understanding of the component usage in your organization. That data however, can only be linked based on a matching of hashes, which can be exact or similar, and in some cases, unknown. We discuss these three match types below.



Figure 4.30: Filter and Matching Options

Exact

An exact match means that a one-to-one link was found between a component hash in your application, and our database. All the data you see represented corresponds to a component we have identified and collect information for. This is the best case scenario with regard to component identification, and most components should fit in this category.

Similar

A similar match is found using proprietary matching algorithms, and is our best guess for a component that you have in your application. In some cases, multiple matches may be found, and this is where the *Similar* section of the CIP is important. While the most likely match is used to display any information about a similar matched component, you can see all other matches in this section of the application composition report. An example is displayed in Figure 4.13.

Unknown

There are instances where not even a similar component match can be determined. This should be considered a serious situation, at least one that needs to be investigated. This could be a case of a component being recompiled and modified so that a match to our database is no longer possible.

However, there is a chance that component is something malicious introduced into the application. Either way, an unknown component is one that Sonatype CLM has no information for. Of course, if during your investigation, you are able to identify the component, you can claim that component, via the *Claim Components* section, which we will walk you through in more detail a little bit later. An example is displayed in Figure 4.29.

Note

Unknown components will not be displayed in the *License* tab until they have been claimed.

In addition to the main filters above, you can also control whether all violations for each component will be displayed. By default the summary of violations is shown. This means that only the worst violation for a component will be shown, and the component will only appear once in the list. Choosing All or Waived, will show all violations (including those waived), or only the waived violations, respectively.

Note

Changing the Violations filter can result in the components being displayed in the component list more than once.

4.5.2 Managing Proprietary Components

Simply put, proprietary components are those components that are unique to your organization. In many cases these are actually developed by your organization and distributed among the applications you develop.

As with matched components, proprietary is one of the options included in the *Filter* on the *Policy* tab of the application composition report. Unfortunately, there is often a little bit of confusion around identifying a proprietary component, so lets start first with what a proprietary component is.

Policy Threat	Component	Popularity	Age	Release History
None	Search Component sample-application.zip	No Popularity Data		9 years

Figure 4.31: Proprietary Component

First and foremost, it's important to point out that a component identified as proprietary is not "matched" as proprietary.

Identifying a component as proprietary is separate from our matching process. In this, a component identified as proprietary will also be assigned to one of three match states: similar, exact, or unknown. In most cases a proprietary component is unknown. As a suggestion for figuring out which of your components are proprietary, a good place to start is by reviewing unknown components.

Note

Policy can be set in such a way as to exclude components marked as proprietary from triggering violations. Care should be taken in using that condition.

To set up proprietary identification, follow these steps:

1. First, make sure you are logged into the Sonatype CLM Server with admin-level permissions (a member of the Global Role, Admin).
2. Click the *System Preferences* icon , and then the *Proprietary Components* option.
3. Sonatype CLM provides two methods for identifying proprietary components.
 - a. **Method 1:** Add packages that are considered proprietary. For example, if we entered `com.sonatype`, all components that contain a package `com/sonatype` would be marked as a proprietary component, and therefore not evaluated. Care should be taken to be as specific as possible here, as the provided package is compared greedily against your scanned binaries. For instance, if you specify `com.sonatype` it will match all of the following content locations:
 - `com/sonatype`
 - `com/sonatype/anything`
 - `com/sonatype/anything/more`
 - `shaded/and/relocated/com/sonatype`
 - `shaded/and/relocated/com/sonatype/anything`On the other hand, the following locations would not be matched for our example:
 - `org/sonatype`
 - `com/sonatypestuff`
 - `com/sonatypestuff/anything`
 - b. **Method 2:** Enter a regular expression, which will be compared against the paths of all files scanned. This is provided as a means for recognizing components as proprietary based on the existence of a specific file within them.

If you choose this option, make sure to click the *Regular JAVA Expression (RegEx)* check box. For more information on regular expressions, check out [Oracle's Java documentation](#).

An example of a regular expression might be `test\.*.zip`. In this example anything in the top level directory named `test.zip` would be marked as a proprietary component. If you wanted to apply this to match a file named `test.zip` nested anywhere within the scanned binaries, use `.*\test\.*.zip`.

Note

Occurrences inside the identified archive will make the binary proprietary as well. For example, if a proprietary zip is found inside a jar, the jar is also considered proprietary.

4. After entering your proprietary component identification, click the *Add* button. This will queue your new proprietary component identifier for saving. Additionally, click any remove icon (resembles a minus symbol) in the list to remove an entry. No changes will be persisted to the server until you click the *Save* button.

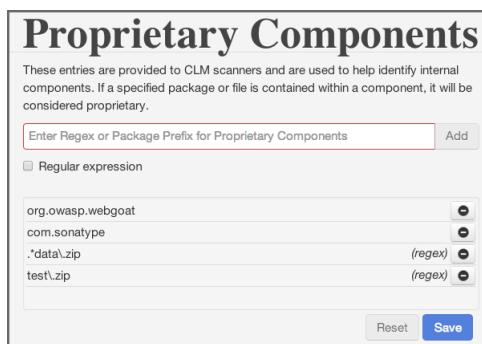


Figure 4.32: Proprietary Packages Configuration via the Sonatype CLM Server

Once your proprietary components are configured Sonatype CLM will look at the component and the directory structure of the application being evaluated. If it matches your proprietary component configuration, it will be identified as proprietary and displayed accordingly in the reports.

Remember, proprietary is not a type of match. Most proprietary components will still be identified as unknown. That's not a hard fast rule, but it is the most common case.

Tip

The proprietary component changes will not be evaluated against existing reports, but will be picked up on the next evaluation.

4.5.3 Claiming a Component

When a component is similar or unknown, yet you are certain the component is recognized by your organization, Sonatype CLM includes functionality to prevent that component from being identified as similar or unknown in future reports. In other words, Sonatype CLM allows you to claim the component as your own.

Once claimed, that component will be known to the CLM server. It will no longer be treated it as *Similar* or *Unknown*, and instead result in an *Exact*.

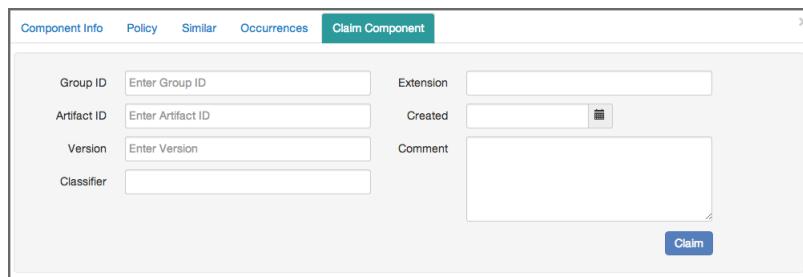


Figure 4.33: Claim a Component

1. Access an application composition report.
2. Click the *Policy* tab, and then click the *Unknown* or *Similar* component filter.
3. Click the row of component you wish to claim in the list - the Component Information Panel is displayed.
4. Click on the *Claim Component* section of the CIP .
5. Enter values for the coordinates of the component.
6. As an option, enter the coordinates classifier and extension, the *Created Date*, and/or a *Comment*. The created date is initialized with the date of the youngest entry in the component to be claimed.
7. Click the *Claim* button, to officially stake your claim for the component.

On review of the existing report, as well as those in the future, there is now an indicator that information about the component has been edited. When hovered over, a tooltip is displayed identifying that the component has been claimed.

We refer to this as the edited component tick mark (a small red triangle) on all future scans for this application, as well as any application with a valid Application ID on the CLM Server.

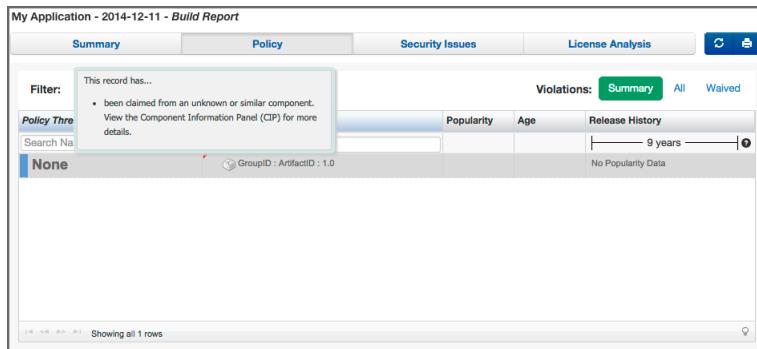


Figure 4.34: Claimed Component Indicator

In addition, the *Component Info* section for the claimed component will now have two new fields, one indicating the *Identification Source* is *Manual*, and the other, *Identification Comment* will include any comments that were entered. While any policy violations will be displayed, the component graph will not.

Finally, if you have made a mistake and wish to revoke the claim on the component or make an edit, click on the Claim Component tab. Then, use the *Revoke* or *Update* buttons respectively.

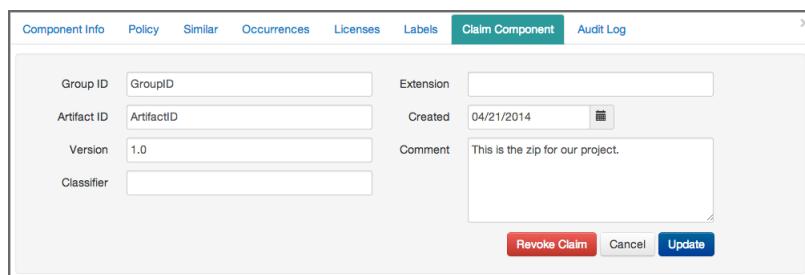


Figure 4.35: Update or Revoke Claimed Component Indicator

Tip

Use the cancel button to undo any changes you made but haven't saved.

4.5.4 Summary

Component identification may seem like a slightly tedious task in the beginning, but it has rewards that pay off in the long term. That's because once you identify (claim) a component, it becomes known to the Sonatype CLM server. This is great because, any other application that includes that component will no longer treat it as unknown either. Of course this section should have shown you a few other things as well, here's a highlight:

- Understanding how components are matched.
- Claiming an unknown component.
- Setting up and identifying proprietary components.

4.6 Label Overview

Labels are one of the more powerful features of Sonatype CLM, though they operate similar to other label or tagging systems you have likely used. Basically you create a number of labels or tags as a set of available values and then assign them.

For example in a photo collection you could have labels for the content like *sunset*', *mountain*, *ocean*, *waterfall* and so on. An individual photo could then have multiple of these labels assigned. In a similar way you can use labels in Sonatype CLM to identify a particular type of component. An *approved* component or a component that *needs research*. Labels can be anything you desire and can have a number of contexts as well. Some labels might be architecture related, while others are related to legal and security properties and yet others are simply signaling ownership by a specific team. The flexibility of the label system allows you to design your own use cases and implement them.

Label creation and management is performed in the Sonatype CLM server organization and application configuration. Assigning those labels to a particular component is a function of the application composition report.



Figure 4.36: Labels at the CLM Server Level

4.6.1 Where do labels begin?

Initially, label assignment might seem like a task that deserves less process. It's actually the opposite.

The label process actually starts at the Sonatype CLM server, where each organization, and in many cases application, have a specific set of labels.

Creating labels at this level means that they are available to users of the application composition report. So, before you label something, a number of things need to be considered, which might mean you need to go back to label and policy management. Let's take a look at some questions that we can use to form a baseline to what labels we need and/or should have.

Do we have a process defining labels, as well as how and when they should be used? Every label should have a reason for using it. If it doesn't you don't need it. That's because people will naturally infer meaning to the label. For example, if you have a *needs review* label, you should have a process for reviewing components with that label. It shouldn't merely be a tag. You should also consider adding labels such as *reviewed*, so someone can tell if something was reviewed. The possibilities are endless, but this may mean you need to rethink the labels you have, or should create.

Should this label apply to only my applications, or all applications for this organization? We like to refer to this as the scope of a label. A good way to look at scope is the concept of macro and micro. At the macro level we have an organization that may have thousands of applications. If I apply this label to the component at the macro level (organization) it means the label will be seen by all applications under that organization. That's a pretty sweeping change, and it could be the right thing to do. However, you might actually be better served by considering the impact at the micro level. In this case, maybe this is a

label that should only be applied to a particular application.

Note

Only labels that have been created at the organization level, can be assigned to the scope of organization.

If I apply this label, is it part of a policy, and does it escape certain violations? Conditions in a policy can include values for labels. In many cases, this is best used as a way to prevent a certain component from violating the condition. For example, I could have a policy that requires a component to be no older than three years. However, a safe, and commonly used component is four years old. If I have a process built around reviewing a case like this, where an exception would be valid, I could first place labels to identify the component to be reviewed for an exception, and then another label once that exception is approved (or disapproved). In this scenario, if I have built policies correctly, including allowing them to flow through certain stages, even with a violation, development can continue. This of course should occur simultaneously to a review/exception process. It's important to consider scenarios like this when creating labels, as well as policy.

There are more questions regarding labels that should be asked as well, but many of these you will discover as you develop your own processes. The key is that labels can be deceptively simple, given their implementation in other systems. The reality is, that in Sonatype CLM, they are much more than just a component tag. Now that you have the word of warning, let's take a look at how to assign a label.

4.6.2 Assigning a Label

When assigning a label, you will only have access to those labels created specifically for the application, or for that application's organization. Given this, if you don't see a label you need, speak with whomever is responsible for managing the labels for your application and the organization the application is associated to.

1. Access the Application Composition Report for your application.
2. Click on the *Policy* tab.
3. Click a component you wish to assign a label to. The Component Information Panel (CIP) displays.
4. Click the *Label* option from the CIP menu. Two boxes will be displayed:
 - a. The *Applied* box on the left represents labels that have been assigned to the component already.

- b. The *Available* box on the right displays all labels.
5. Clicking on the button on the right side of a label will move to the opposite side. Hovering over a label displays the description.
6. Click on the + button on the right side of a label in the *Available* list to assign the label to the component.
7. Click on the - button on the right side of a label in the *Applied* list to remove the label from the component.

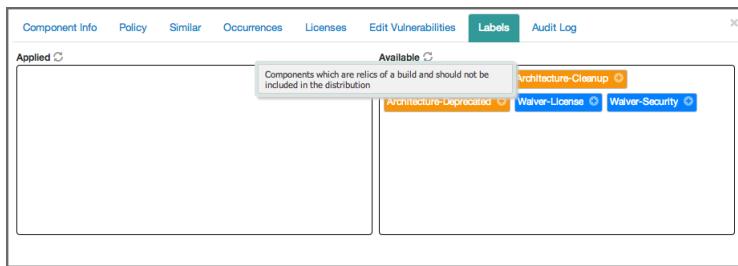


Figure 4.37: Assigning a Label

If the label was created at the organization level, you will be presented with two options:

- Apply the label to the current component in the current application
- Apply the label to the current component within the organization, so that all applications within the organization gain access to the label assigned.

4.6.3 Summary

Labels can be abused as easily as they can be used properly. Their simplicity can be deceiving, which means if you find yourself creating labels quickly, you might be approaching it from the wrong direction. Given that, here are some things to take away from this section:

- You understand the difference between label assignment and label management.
- Remember to ask the right questions before assigning labels.
- You can assign a label to a component at the application or the organization level.

4.7 Waivers

If you look at policy violations as a pain point preempting the flow of work, you are likely going about using Sonatype CLM the wrong way. In fact, if you saw the title of this section, hoping to find a way past policy violations, there may be a couple issues.

First, your policies should be designed to encourage workflow and communication. If development is being stopped regularly, you might want to revisit your policies, refining them so they present the possibilities for making better choices, not simply halting work altogether.

Second, and perhaps most importantly, Sonatype CLM does not present false positives. If you are looking for ways just to get past a violation, you've circumvented the goal of policy creation as well as Sonatype CLM. Again, this might be a problem with policy, or the perception of what should and should not be in your application.

OK, so excluding those possibilities, and working with the idea that you are here to find a way to accommodate the exceptions you may run across, waivers can help.

4.7.1 A Use Case for Waivers

Let's say, you have a component that's violating a policy, which has been created in an organization that houses your application. It's a great policy, in fact, one of many great policies. Unfortunately, one of your applications has a component that is violating a policy.

The problem is, that this policy just doesn't accurately line up to the implementation of this particular application. Your application has a security vulnerability that can be exploited when it connects to the internet. It's a pretty severe vulnerability, but benign given that your application is internal, and doesn't even have the ability to connect to the Internet.

What should you do?

You could...

- Change the *Security Status* to *Not Applicable*.
- Adjust the policy to be less stringent.

- Use labels in a conditions, providing an escape for exceptions.
- ... or, you could add a waiver.

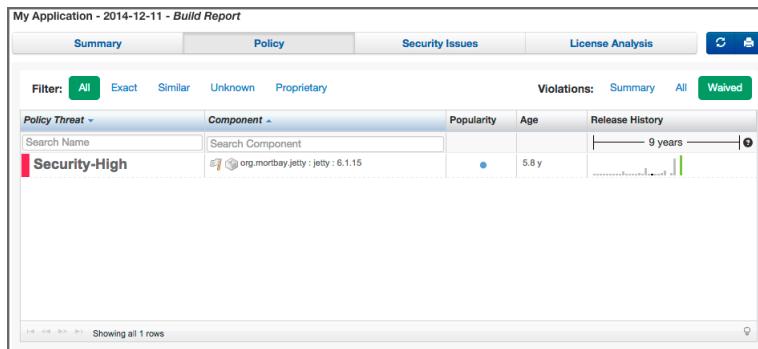


Figure 4.38: Waiver Visualization on Policy Tab

That is, by adding a waiver, you indicate that this particular component, either in the scope of this application (what we would do in our example), or all applications for the organization, is waived from this particular policy. In fact, if you desired you could even specify that you want to waive all components (within scope of an application or organization) from a policy.

Now the important thing to take note of here, is that while this waiver seems to be the answer to policy violations strife, you are actually waiving an entire policy. This means all constraints, and in turn, all conditions. It's no surprise why that should be something that's limited. For this reason, before waiving something, it's good practice to review some alternatives. A waiver very much does allow you to simply bypass all controls.

OK, we've harped enough on the warnings. The benefits of waivers can be just as numerous. This is because even with endless customizations, you will encounter situations where a policy just doesn't apply. It's important to take a look at the full range of waiver functionality, so let's look at how to add, view, and when necessary, remove a waiver.

4.7.2 Adding a Waiver

Policy/Action	Constraint	Condition Value	Waivers
Security-Medium	CVSS >=4 and <7	Found 3 Security Vulnerabilities with Severity >= 4 Found 3 Security Vulnerabilities with Severity < 7 Found 3 Security Vulnerabilities with Status OPEN	<button>Waive</button>
License-Observed Only	Not Declared but Observed	Found 'Apache-1.1' and 'Apache-2.0' and 'Not Declared' Licenses Found 'Liberal' License Threat Group	<button>Waive</button>
Architecture-Quality	Unpopular Old	Relative Popularity was 1% Component does not contain proprietary packages Age was 8 years and 24 days	<button>Waive</button>

Figure 4.39: Waiver Button

1. Access an application composition report.
2. Navigate to the *Policy* tab on the report, and click on a component that has policy violations. This will display the Component Information Panel (CIP).
3. Click the *Policy* tab. This will display the list of Policy Violations for the Component visible in Figure 4.39.
4. Click the *Waive* button next to the violation you wish to waive. A modal dialog similar to Figure 4.40 will display.
5. There are several options at this point, and each should be carefully considered:
 - a. The first option defines the scope for the waiver. This can be either the current application, or all applications for the organization.
 - b. The second option defines the target of the waiver. That is the currently selected component, or all components.
6. Enter an optional *Comment*, and then click the *Yes* button to process the waiver.



Warning

When processing a waiver, depending on the options that are chosen, you can effectively waive a policy for all components, for all applications in an organization. Since this will waive the entire policy, not just this violation, it may be a good idea to ensure adjusting the policy would not provide a solution that is more visible to all users.



Figure 4.40: Options to Apply Waiver to the Application or the Entire Organization

4.7.3 Viewing and Removing a Waiver

As we mentioned previously, component violations can be waived for a single component in a single application, all the way up to all components in all applications. This means, that a violation for a component in your application could have been waived elsewhere. A good practice when reviewing the Application Composition Report is to check and see what violations have been waived for components in your application. Here are a couple examples of why this is important:

- Scenario 1: A violation for a component has been waived, and the component has additional violations. Depending on the view selected, at least one of these additional violations will be displayed.
- Scenario 2: The only violation for a component has been waived. Given that the component has no additional violations, it will be moved into the **None** policy threat group (light blue) in the Summary view, while the other views will only show the waived violation.

To view waived violations for your components, follow the instruction below.

1. First, access an application composition report.
2. Navigate to the *Policy* tab on the report. Just above the list of components, and to the right of the report, you will see three options in the Violations filter:
 - a. Summary - this is the default view of the Policy tab. It is important to note, that even though this view will display all components, only the highest threat violation per component is displayed. In this view, components with waived violations may have been moved to the **None** policy threat group (light blue).

- b. All - clicking this filter option will display every violation for all components in your application. This may result in the appearance of duplicates in the component list. Violations that have been waived will be indicated by a white flag icon.
 - c. Waived - clicking this filter option will display only the waived violations. In this view, you will only see those components where violations have been waived. Each component will have a white flag icon, and it is likely you will not see all components. This view may also produce the appearance of duplicated components.
3. Click on a component to display the Component Information Panel (CIP). For an example, see Figure 4.39.
 4. At the top of the component list, click on the *View Existing Waivers* button. A modal will be displayed showing all the waivers for the component, as well as the associated descriptions.
 5. Click the remove icon, which resembles a minus sign.
 6. A message will ask you to confirm this removal. Click the *Remove* button to continue.

Note

Because some waivers can be set for all applications, and even all components, it's important to understand the impact of removing a waiver. Be sure to verify with the application or organization owner, the intended scope of the waiver.

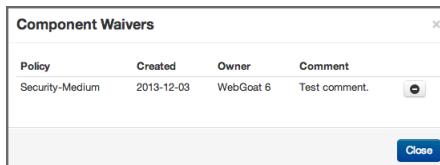


Figure 4.41: View and Remove Waivers

4.7.4 Summary

If anything can be said, the ability to apply a waiver is easy. That ease can make them dangerous, but is also their source of power. It's important to respect the ability to waive violations. This helps ensure they will serve as a tool in assisting to make your applications the best they can be. Let's take a look at what we covered.

- Reasoning for using, as well as not using, waivers.
-

- Adding, viewing, and removing waivers

4.8 Policy Reevaluation

You will likely find a number of consistent themes through the Sonatype CLM documentation. One of these is that regular policy review and refinement should be part of your companies approach to component lifecycle management.

Accomplishing this successfully could potentially mean regularly rebuilding applications or publishing them to repositories several times over. Not to mention that in the case of waiting for builds, you might wait hours before a scan is able to run.

This isn't an issue linked to Sonatype CLM, but rather the length of time it takes to build your application. No matter the reason, it really means access to the new results could be delayed, and the change you made to policy or statuses might not have even made a difference. You'll soon need to make another change, and then wait again. Luckily there is an alternative provided by Sonatype CLM. It allows you to reevaluate the results of a scan in the form of an application composition reports, which will use the existing component information from a scan and evaluate it against the current policies - which you might have changed since the last build and analysis.

To address this, you can use policy reevaluation to see how your changes affect the current policy. The policy reevaluation button, locate in the top right of the application composition report (to the left of the PDF Export/Printer icon). Simply click this button displayed in Figure 4.42, and any policy changes you've made will be considered against the data of the current report.



Figure 4.42: Application Composition Report Buttons For Printing and Reevaluation

Alternatively you can reevaluate policies right from the application configuration screen in the Sonatype CLM server. Simply find your application, and locate the stages report you want to re-evaluate under the application name beside the icon. Any stage that had a report processed will have a reevaluation icon right beside the stage name.

Of course, it's possible other data in the application could have changed, and that might not be realized until the next build. However, this will give you a good idea of how immediate policy changes impact any violations you currently have.

Note

Policy Reevaluation will not enact any actions you may have attached to your policies.

4.8.1 Summary

When you are first developing and making changes to your policy, it's best to choose an application with a short build time. If that's not possible, the Reevaluation button can be a real time saver. Remember though, reevaluation simply applies policy to the most recent scan results. If someone has processed a new build, you could be looking at those changes.

4.9 Sonatype CLM PDF Report

In some implementations of Sonatype CLM, not everyone will have access to the CLM Server or any of the integrated enforcement points, and in turn, any of the associated reports. However, certain individuals or teams would likely still benefit from the information the CLM Report provides. Even if that's not your particular situation, you may reach a point where you would like to produce an archive of a report for historical and audit purposes. Given this need, every report you produce with Sonatype CLM can be converted into a PDF.

Though the information presented in both the web application and the PDF are nearly identical, there are a few differences, mainly formed out of the contrasting visual and layout capabilities of a web application versus PDF. Below, we'll discuss how to create this PDF version as well as highlight some of the differences between the two.

4.9.1 Creating the PDF

If you've been working with Sonatype CLM for a while, you might have started to notice a set of blue icons in the top right of every report. While the first icon is related to reevaluating the report, the button on the right allows you to create a PDF version of the report. Simply, click on this button  and Sonatype CLM will prompt your browser to download a PDF version of the report.

Note

The report filename will be unique each time you use the button. However, in general the report will include the job name, build number, and the timestamp associated with the results. For example, `clm-0-20131017-140140.pdf`

4.9.2 Reviewing the PDF

The information provided by the PDF is identical to information that is provided within the application composition report in the application user interface. This includes the *Summary*, *Policy*, *Security Issues*, and *License Analysis* tabs. Within the PDF, the order of information is presented top to bottom, following the logic of the report tabs from left to right. With the exception of the first page, which provides the *Summary*, each section has a label to indicate the corresponding tab of the Application Composition Report:

Policy Violations

displays a list of all policy violations, ordered by threat level, for each component.

Security Issues

displays a list of all security issues, ordered by SV score, for each component.

License Analysis

displays a list of components, ordered by threat level of the associated license threat group for the license(s) for the component.

Components

lists all components identified during the scan, as well as a summary of the data provided in the other tabs.

Summary

The summary section is identical to the HTML version of the report and visible in Figure 4.43

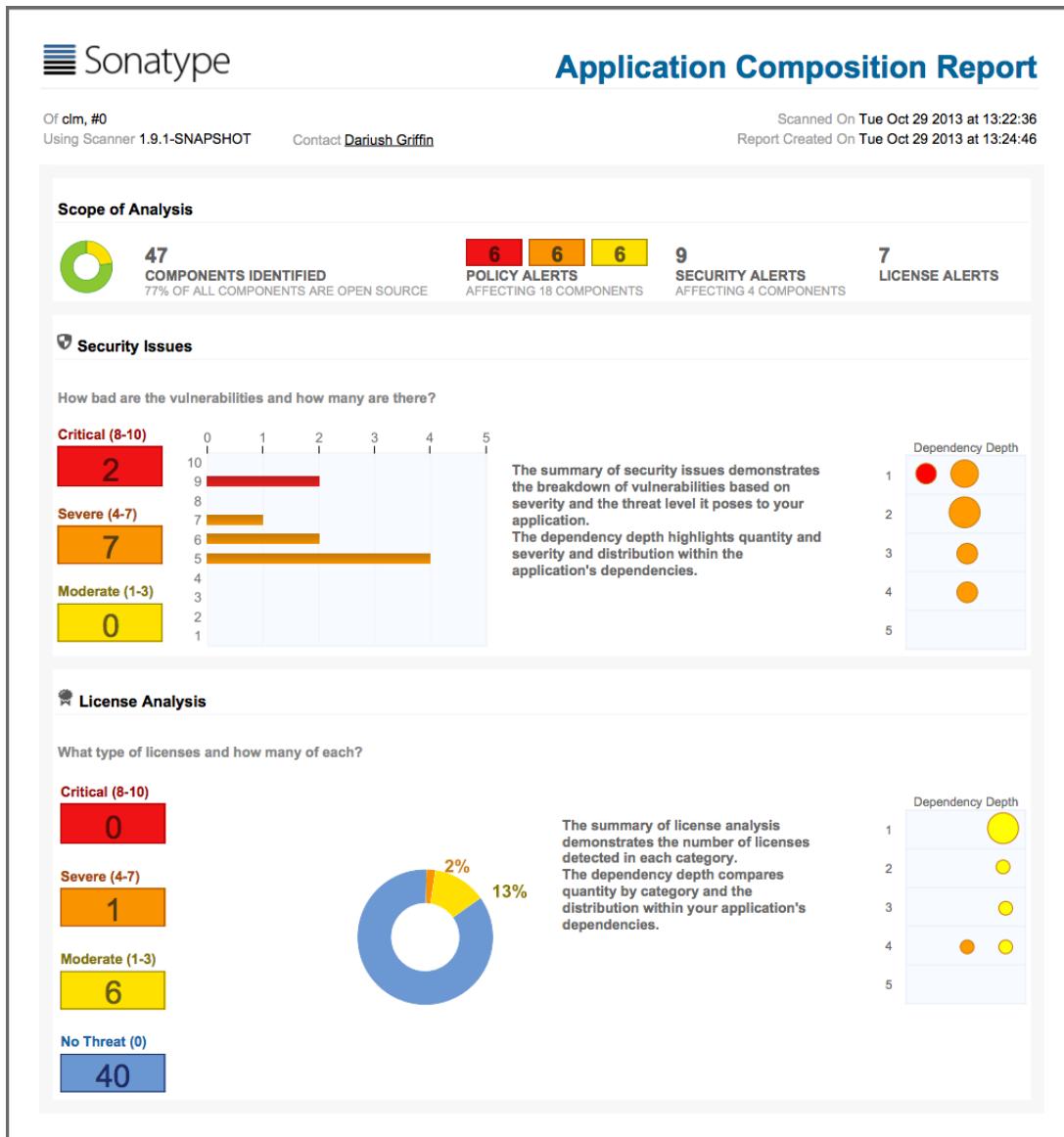


Figure 4.43: Summary Section of a Application Composition Report in PDF Format

Policy Violations

The *Policy Violations* section as visible in Figure 4.44 displays the details for all scanned components. This matches the data displayed in the *Policy* tab of the *Component Information Panel* (CIP). It should be noted, that depending on the number of violations in your application, this section could be very long.

Policy Violations				
Threat	Policy Name	Actions	Component	Conditions
9	Security-High		org.apache.geronimo.framework : geronimo-security : 2.1	Security Vulnerability Severity >= 7, Security Vulnerability Severity < 10, Security Vulnerability Status is not NOT_APPLICABLE
7	Security-Medium		commons-httpclient : commons-httpclient : 3.1	Security Vulnerability Severity >= 4, Security Vulnerability Severity < 7, Security Vulnerability Status is not NOT_APPLICABLE
			org.apache.geronimo.framework : geronimo-security : 2.1	Security Vulnerability Severity >= 4, Security Vulnerability Severity < 7, Security Vulnerability Status is not NOT_APPLICABLE
			org.mortbay.jetty : jetty : 6.1.15	Security Vulnerability Severity >= 4, Security Vulnerability Severity < 7, Security Vulnerability Status is not NOT_APPLICABLE
			org.openid4java : openid4java : 0.9.5	Security Vulnerability Severity >= 4, Security Vulnerability Severity < 7, Security Vulnerability Status is not NOT_APPLICABLE
			tomcat : catalina-host-manager : 5.5.23	Security Vulnerability Severity >= 4, Security Vulnerability Severity < 7, Security Vulnerability Status is not NOT_APPLICABLE
			tomcat : servlets-default : 5.5.4	Security Vulnerability Severity >= 4, Security Vulnerability Severity < 7, Security Vulnerability Status is not NOT_APPLICABLE
			tomcat : tomcat-util : 5.5.23	Security Vulnerability Severity >= 4, Security Vulnerability Severity < 7, Security Vulnerability Status is not NOT_APPLICABLE

Figure 4.44: Policy Violations Section of a Application Composition Report in PDF Format

Security Issues

The *Security Issues* section displays a breakdown of all security issues found in the scan of the application, matching what is displayed in the HTML version of the report. An example is available in Figure 4.45

Security Issues

Threat Level	Problem Code	Component
9	CVE-2008-5518	org.apache.geronimo.framework : geronimo-transaction-2.1.1
	53927	org.apache.geronimo.framework : geronimo-transaction-2.1.1
	53928	org.apache.geronimo.framework : geronimo-transaction-2.1.1
	53929	org.apache.geronimo.framework : geronimo-transaction-2.1.1
7	CVE-2009-4611	org.mortbay.jetty : jetty : 6.1.15
	75808	org.mortbay.jetty : jetty : 6.1.15
6	CVE-2009-0039	org.apache.geronimo.framework : geronimo-transaction-2.1.1
	53932	org.apache.geronimo.framework : geronimo-transaction-2.1.1
5	CVE-2012-5783	commons-httpclient : commons-httpclient : 3.1
	87160	commons-httpclient : commons-httpclient : 3.1
	CVE-2009-1523	org.mortbay.jetty : jetty : 6.1.15
	CVE-2011-4461	org.mortbay.jetty : jetty : 6.1.15
	54186	org.mortbay.jetty : jetty : 6.1.15
	78117	org.mortbay.jetty : jetty : 6.1.15
	CVE-2011-4314	org.openid4java : openid4java : 0.9.5
	73737	org.openid4java : openid4java : 0.9.5
	CVE-2007-5333	tomcat : tomcat-util : 5.5.23
	CVE-2012-0022	tomcat : tomcat-util : 5.5.23
	41435	tomcat : tomcat-util : 5.5.23
	78573	tomcat : tomcat-util : 5.5.23
4	CVE-2012-0150	

License Analysis

The *License Analysis* section displays a breakdown of all license issues found in the scan of the application, matching what is displayed in the HTML version of the report. It should be noted that depending on your license threat groups, and license assignments, this section of the report could be very long. A short example is displayed in Figure 4.46.

License Analysis

License Threat	Component
Not Declared, GPL, GPL-2.0+	cobertura : cobertura : 1.6
MIT, Apache-2.0, CC-BY, GPL-2.0+, LGPL-2.1+, Non-Standard	edu.ucar : unidataCommon : 4.2.20
GPL-3.0, No Sources	javancss : javancss : 29.50
LGPL-2.1, BSD-3-Clause, LGPL-2.0+, Non-Standard	edu.stanford.ejalbert : BrowserLauncher2 :
Apache-2.0, Non-Standard	org.mortbay.jetty : jetty : 6.1.15
LGPL-3.0, LGPL	ch.qos.logback : logback-access : 0.6
EPL-1.0, No Sources	org.eclipse.foundation : org.apache.lucene : 2.9.1.v20100421-0704
EPL-1.0, No Sources	org.eclipse.foundation : org.slf4j.api : 1.6.1
LGPL-2.1, No Sources	org.opencms.modules : com.alkacon.open
Apache-2.0	commons-beanutils : commons-beanutils :
Apache-2.0	commons-dbcp : commons-dbcp : 1.4
Apache-2.0, Apache	commons-httpclient : commons-httpclient :
Apache-2.0	commons-pool : commons-pool : 1.4
Not Declared, Apache-2.0	geronimo : geronimo-tomcat : 1.0
Not Declared, Apache-2.0	geronimo : geronimo-tomcat-builder : 1.1
BSD-3-Clause	net.sf.xradar : xradar : 1.1.2
Apache-2.0, BSD-3-Clause, MIT	org.apache.avro : avro ipc : 1.5.0
Apache-2.0, No Sources	org.apache.flume : flume-core : 0.9.0-incubating-1.0.0

Components

As mentioned above, this section brings together information from all the others. It displays the highest security issue identified (and the associated CVS Score), any declared and/or observed licenses (and the highest threat level of the associated), the match state, age, and the policy violation counts for each threat level band (red, orange, yellow, and blue) for each component. An example is displayed in Figure 4.47. In most cases this section can be used as a detailed bill of materials.

Components

Component / Declared and Observed License	Match State	Age
ch.qos.logback : logback-access : 0.6	exact	8 years
LGPL-3.0; LGPL		NA
cobertura : cobertura : 1.6	exact	9 years
Not Declared; GPL, GPL-2.0+		NA
commons-beanutils : commons-beanutils : 1.8.3 exact		4 years
Apache-2.0		NA
commons-dbcp : commons-dbcp : 1.4	exact	4 years
Apache-2.0		NA
commons-pool : commons-pool : 1.4	exact	7 years
Apache-2.0		NA
edu.stanford.ejalbert : BrowserLauncher2 : 1.3 exact		3 years
LGPL-2.1; BSD-3-Clause, LGPL-2.0+, Non-Standard		NA
edu.ucar : unidataCommon : 4.2.20	exact	3 years
MIT; Apache-2.0, CC-BY, GPL-2.0+, LGPL-2.1+, Non-Standard		NA
geronimo : geronimo-tomcat : 1.0	exact	9 years
Not Declared; Apache-2.0		NA
geronimo : geronimo-tomcat-builder : 1.1	exact	8 years
Not Declared; Apache-2.0		NA
javancss : javancss : 29.50 exact		6 years
GPL-3.0; No Sources		NA
net.sf.xradar : xradar : 1.1.2 exact		4 years
BSD-3-Clause		NA

Note

In some cases a URL for the project is provided. This is indicated by an information icon ⓘ.

4.9.3 Summary

In general, there's not a lot of new content here. If you have seen the Sonatype CLM Application Composition Report, then this is simply the PDF version of that report. However, here are the items you should take away from this section.

- How to create a PDF version of the Application Composition report.
- Understanding what the PDF does (and does not provide).

4.10 Conclusion

This chapter covered a lot. In fact, it's one of our most in depth guides, covering all aspects of the reports provided by Sonatype CLM.

Still though, there is even more. As you encounter violations, and applications that become the exception not the rule, you will need to use the whole range of tools presented here. Remember though, the reports serve not just as tools to find and report violations, but also a way to refine, adjust, and evolve your policies and internal processes over time. For now though, let's take a quick look at the high level topics we covered.

- Report Access
- The Four Tabs
- Component Information Panel (CIP)
- Security Vulnerabilities
- License Analysis
- Component Identification
- Label Assignment

- Waivers
- Reevaluation
- PDF Capabilities

Chapter 5

Sonatype CLM Server - Dashboard

5.1 Introduction

As you manage policy and evaluate applications, you are gathering a fair amount of data related to policy violations, security vulnerabilities and license issues. Ideally, you want to focus on areas that represent the highest risk, and resolve those quickly. This can be easy to do if you only have to work on a single application; however, the moment you have much more than that, the necessity for a more cumulative approach is needed.

The Sonatype CLM Dashboard provides the quickest way to review the overall health of the applications you manage. Whether you are looking to find the worst violations or the newest, the dashboard should be the first place you review each day.

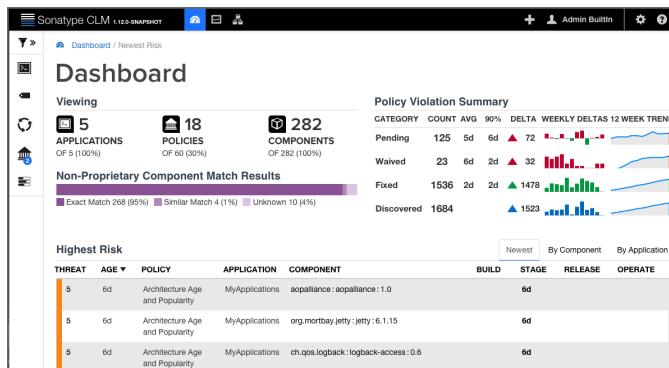


Figure 5.1: Dashboard Default View



Important

Users of Nexus CLM Edition do not have access to the Sonatype CLM Dashboard. Because of this, these users will not be taken to the dashboard after logging in, nor will they see the dashboard icon. Rather, the reports area will display by default.

5.2 Accessing the Dashboard

Once logged into the CLM Server, the Sonatype Dashboard will display by default. If you are in any other location of the CLM Server, simply click the Dashboard icon

 located in the header.

Note

The dashboard is only available via the Sonatype CLM Server, and only displays information for applications you are permitted to see. This requires that you, at a minimum, be in the **developer role** for at least one application.

5.3 Viewing CLM Data in the Dashboard

Data displayed in the dashboard is based primarily on violations found during the evaluations of your applications. It is organized into three distinct areas:

- Filters
- Visual Overview
- Highest Risk Violations

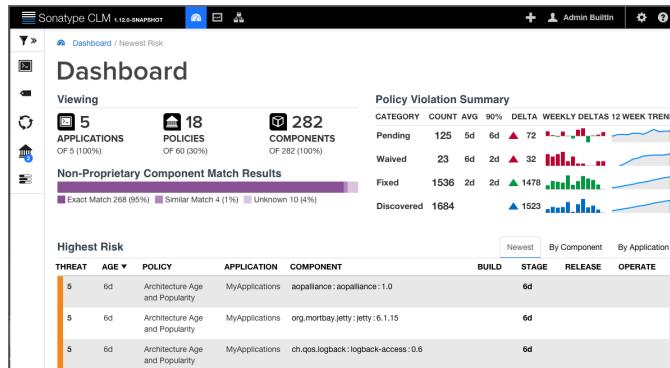


Figure 5.2: Accessing the Dashboard

Note

When navigating the dashboard, clicking on the breadcrumb link will return you to the most recent tab.

5.3.1 Filters

Filters allow you to adjust the data that is displayed in the dashboard. While this gives you greater control over what is viewed, in some cases this may limit the display of certain information.

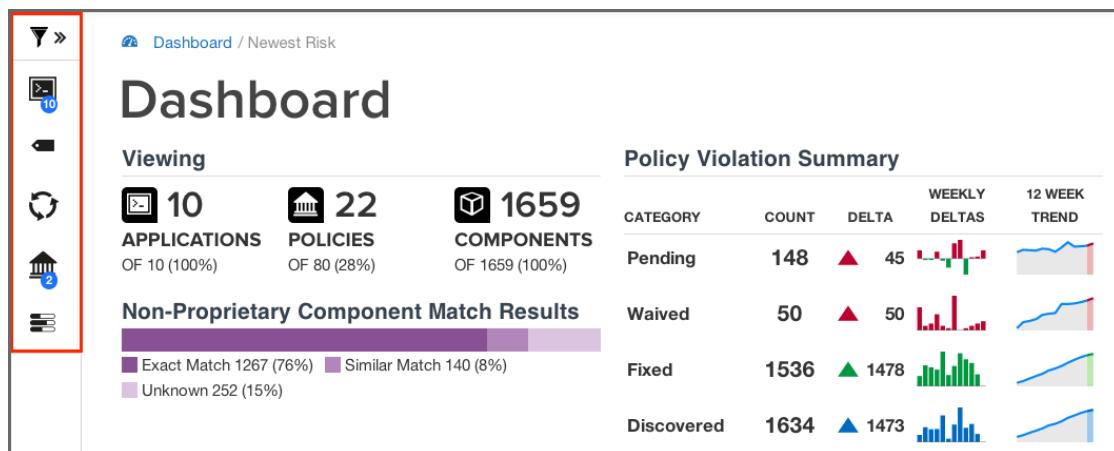


Figure 5.3: Dashboard Filter Example

This is most apparent with regard to the display of threat level ranges (Critical, Severe, Moderate, and Low). Based on what filters are set, any columns that display this data may be completely hidden from view.

For example, by default the threat level filter is set to exclude any violations of policies with a threat level less than or equal to 1. Given this, the low threat level column will not be displayed.

The *Filter* icon is located to the left of the Sonatype CLM screen, just below the Sonatype logo. To edit the various filters that are available, click on the chevron to the right of the *Filter* icon Filters ▾. This will cause the *Filter* menu to slide out to the right.

Note

To close the *Filter* menu, click the chevron next to the *Filter* icon.

With the *Filter* menu open, make selections using the five available filters, and then click the *Apply* button. Any filters that are not set to *All*, will have a blue circle, with the total count of selected filter options.

For example if you selected five applications, the *Applications* filter would have a blue circle with the number five. The same is true with all the filters, including threat level. In the case of the latter, the total number of threat levels selected in the filter, not the actual threat level, is displayed.

To reset the filters, click the *Reset* button, and then *Apply*.

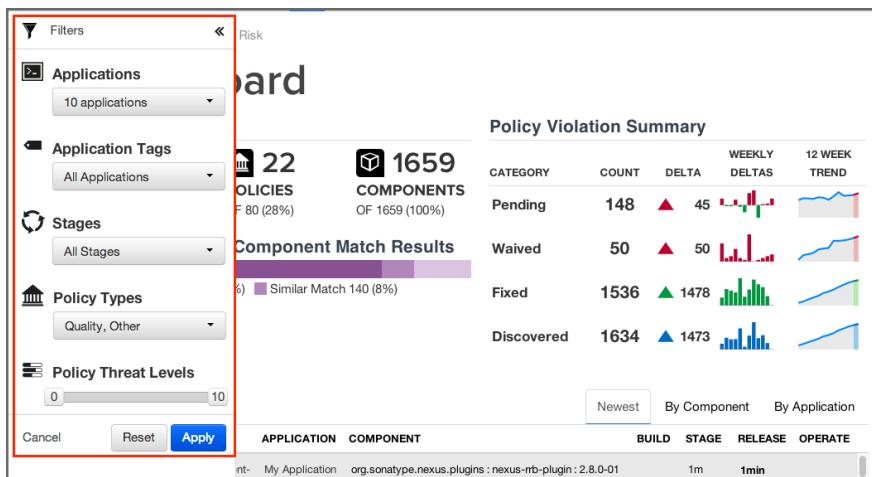


Figure 5.4: Filtering the Dashboard

Tip

After exiting the Sonatype Dashboard area and/or logging out, your most recent filters will persist for your account when you return.

The available filters have been described below.

Applications

The application filter allows you to select which applications you want displayed in the violation lists.

Application Tags

The tag filter allows you to isolate violations for applications associated with a particular tag.

Policy Type

The policy type filter allows you to select which types of policies you want displayed in the violation lists. Sonatype CLM automatically assigns type based on conditions included within the policy. The following rules are used to determine a policy's type:

Security

If there are any security conditions, it is considered a security type policy.

License

if there are any license conditions, it is considered a license type policy.

Quality

if there are any age or popularity conditions, it is considered a quality type policy.

Other

if there are any conditions not mentioned above, it is considered an other type policy.

Note

A policy can only ever be of one type. In cases where a policy has conditions that meet more than one of the rules above, the order above dictates the type of policy. For example, if a policy has security and license conditions, it would be considered a security type of policy.

Stages

Violations can occur in different stages, and this will likely affect how much attention you decide to give at a particular point in time. Using this filter, you can show violations for a specific stage. The available stages include:

- Build
- Stage Release
- Release
- Operate

Note

Access to stages is limited by your product license, and the filters will reflect this. In addition, when specifying a stage with the filter, those not selected will be hidden from view.

Policy Threat Levels

The Policy Threat Level filter functions as a slider that allows you to select the threat level or a range of threat levels. This corresponds to the threat level of the policy that has been violated.

Note

By default, the Policy Threat Level filter has already been set to only display policy violations with a threat greater than or equal to 2. This means only those violations in the Critical, Severe and Moderate threat ranges will be displayed. As a result, the *Low* threat category column is hidden.

5.3.2 Visual Overview

Just below the customizable filters, are two visual representations of the data.

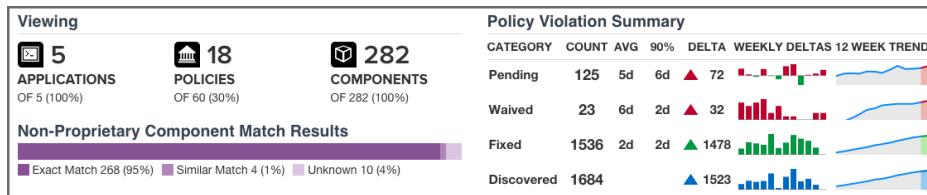


Figure 5.5: Dashboard Visuals

Viewing

While much of the dashboard focuses on policy violations, the information provided in the *Viewing* area covers all components. There is only one exception, proprietary components. That is, the match results will not include any components that are excluded as a result of your proprietary component settings.

The first display shows counts for the number of applications, policies, and components the data in the dashboard represents, identified by their corresponding icon and text label.



Figure 5.6: Counts

Note

In cases where data has been filtered, the counts may not represent all data. In these cases, this will display as a percentage less than 100%.

The second displays the non-proprietary component matches.



Figure 5.7: Matches

When reviewing match data, it is important to remember the types of matches that can occur. It may also be a good idea to review the section of the Report User Guide [focused on Component Identification](#). A brief overview is included below.

Exact Match

Sonatype CLM has matched a component exactly to the one in your application.

Similar Match

Sonatype CLM has found at least one component that may match the component in your application.

Unknown

Sonatype CLM has been unable to identify the component in your application.

Note

In instances where an unknown or similar component has been claimed, it will be considered an exact match.

Policy Summary

In contrast to the count and match data, the rest of the Sonatype CLM Dashboard, including the Policy Summary visualization, is geared towards identifying which components in your applications present risk so you can address them accordingly. This is because understanding how your business is handling risk over time is extremely important. As you are likely already asking, questions such as "How many new violations have been encountered, waived, or fixed," as well as "How many remain unresolved," are just the beginning.

Given this, the main goal of the Policy Summary visualization is to provide a quick, twelve-week look at how risk is entering your applications, and how you are handling that risk.

The Policy Summary area is divided into four categories, with each category having four metrics over a twelve-week period.

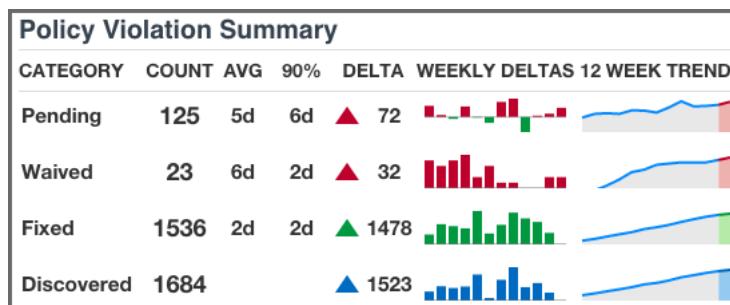


Figure 5.8: Policy Violation Summary

These categories and metrics have been described below:

Policy Summary Categories

Pending

A policy violation that has been *Discovered*, but not yet *Fixed* or *Waived*, is *Pending*.

Tip

Reducing the number of pending violations is a critical task with Sonatype CLM. Weekly deltas above the x-axis indicate there were more discovered violations than those fixed; green bars below the x-axis represent more violations were fixed than discovered.

Waived

This represents a count of policy violations that have been waived. This count is not included in Pending or Fixed, but is included in Discovered.

Note

For more information on waivers, see the [Waivers Section](#) of the Sonatype CLM Application Composition Report documentation.

Fixed

A policy violation is *Fixed* when it no longer exists in any Sonatype CLM stage.

Note

When determining the *Fixed* state of a component, any filtered stages are not considered. That is, if you exclude a stage where a violation has occurred, the count for fixed may increase even though the violation is still present in the other stage.

Discovered

A policy violation is considered *Discovered* when it has been observed for the first time.

Policy Summary Metrics

Count

the total (all-time) count for the category.

AVG

the average age of violations in the category

90%

indicates 90 percent of violations have been in the category less than this time.

Delta

the count for the current week (week twelve), over the first week.

Weekly Deltas

the visual representation of each week's unique delta.

12 Week Trend

the trend over twelve weeks.

Tip

It is not uncommon to see discovered violations trend upwards steeply, especially in the early phases of your Sonatype CLM implementation, and then plateau as you start developing a better component consumption process. Using your mouse to hover over values in the graphs will display the individual values for each week.

5.3.3 Highest Risk Violations

The Highest Risk Violations display is separated into three different views/tabs.

- Newest
- By Component
- By Application

All risk information is based on the state the policy was in at the time of the most recent evaluation, while information regarding the age is taken from the first occurrence of the violation. If policy changes have been made, and a new evaluation has not been conducted, the changes will not be reflected in the currently displayed information.

5.3.3.1 Newest

This is the default view for the dashboard. It displays the first one hundred, newest component violations found in your applications. The data in this view can also be adjusted using the filters, and is organized into a number of columns. These have been described below.

THREAT	AGE ▲	POLICY	APPLICATION	COMPONENT	Newest			
					BUILD	STAGE	RELEASE	OPERATE
7	16d	Security-Medium	MyApplication	org.atnos:resource-server:resource-server-webapp:1.0.41	16d			
9	16d	Security-High	MyApplication	commons-fileupload:commons-fileupload:1.2.1		6m	5m ▲	16d ⓘ
9	16d	Security-High	MyApplication	org.atmosphere:samples:atmosphere-spring-websocket:2.1.6			16d	
7	16d	Security-Medium	MyApplication	org.atmosphere:samples:atmosphere-spring-websocket:2.1.6			16d	
7	16d	Security-Medium	MyApplication	org.springframework:spring-webmvc:3.1.0.RELEASE		6m	5m	16d ⓘ
7	16d	Security-Medium	MyApplication	commons-fileupload:commons-fileupload:1.2.1		6m	5m ▲	16d ⓘ
7	16d	Security-Medium	MyApplication	org.springframework:spring-web:3.1.0.RELEASE		6m	5m ▲	16d
7	16d	Security-Medium	MyApplication	org.atmosphere:samples:atmosphere-spring-files:2.1.6		16d ⓘ		
7	16d	Security-Medium	MyApplication	org.atmosphere:atmosphere-jgroups-demo:2.1.6		16d ⓘ		

Showing the newest 100 results

Figure 5.9: Newest Risk

Note

A violation is only considered new the first time it is discovered, even if it is found in different stages. For example, if a violation is found at the first of the month during an evaluation at the Build stage, and then again at the end of the month at the Release stage, only the occurrence at the build stage is considered new.

Threat

The assigned threat level of the violated policy.

Age

Displays the age of the violation based on the most recent date it occurred.

Policy

The name of the policy violated.

Application

The name of the application the component violating the policy was found in.

Component

The identifying information for a component. For known components, all available coordinate information will be displayed, while unknown components will have the filename. Clicking on the component will display the [Component Detail Page](#).

CLM Stages

The CLM stages follow the four stages that Sonatype CLM employs (Build, Stage (Stage Release), Release, Operate). The amount of time that has passed since discovery of the component in violation of a policy will be displayed in the corresponding column and row. Abbreviations for time is as follows:

- min = minute
- h = hour
- d = day
- m = month
- y = year

If any actions were taken in the stage (i.e. warn or fail), an icon will be displayed. Only the stages which your CLM server is licensed for will appear.

+ TIP: Clicking on the time stamp for the violation will open the most recent [Application Composition Report](#) for the corresponding component and application.

5.3.3.2 By Component

This view displays the first 100 highest risk components based on any filters that have been set and your level of access. Risk is represented in several ranges (Total, Critical, Severe, and Moderate), which corresponds to a color (Black, Red, Orange, Yellow). In addition, shading represents the severity of the risk within a particular column. That is, darker shading indicates the value is more severe relative to the other items in the column.

COMPONENT	AFFECTED APPS	TOTAL RISK	Newest		
			Critical	Severe	Moderate
commons-httpclient:commons-httpclient:3.1	94	1410	0	1128	282
commons-fileupload:commons-fileupload:1.2.2	65	1040	585	455	0
org.springframework:spring-web:3.0.5.RELEASE	41	656	369	287	0
commons-fileupload:commons-fileupload:1.3.1	61	549	549	0	0
commons-fileupload:commons-fileupload:1.2.1	32	512	288	224	0
xalan:xalan:2.7.1	45	405	405	0	0
xerces:xercesImpl:2.9.1	45	315	0	315	0
org.springframework:spring-context:3.0.5.RELEASE	42	294	0	294	0
xalan:xalan:2.7.0	12	288	108	144	36
jstl:jstl:1.2	31	279	279	0	0
hsqldb:hsqldb:1.8.0.7	29	261	261	0	0
org.springframework:spring-webmvc:3.0.5.RELEASE	35	245	0	245	0
dom4j:dom4j:1.6.1	47	235	0	235	0
commons-fileupload:commons-fileupload:1.3	14	224	126	98	0

Showing the top 100 results

Figure 5.10: Highest Risk - By Component

Note

By default only policy violations greater than 1 (i.e. all but low/blue) are displayed and included in the calculations. Given that data excluded by filters is not displayed on the dashboard, the *Low* violations column will not be present. This can be modified by setting the Policy Threat Level filter to include violations below these levels (0/1).

To calculate the total risk for each component, the threat level of all policies the component has violated are added together. In other words, component risk is the sum of policy violation threat levels for the component. A similar calculation is done for each risk range.

Now, this may leave you wondering, "What about the duplication of violations across stages, or even in the same stage?"

Good question.

For all calculations, a violation is only counted once. When there are multiple instances of the same violation, only the most recent occurrence is counted, regardless of stage. Because of this, in cases where a policy has been changed in between evaluations, the violation from the latest evaluation will be included. This will be true, even if the change to the policy included threat level.

Now, let's take a look at each individual column, which has been described below.

Component

The identifying information for a component. For known components, all available coordinate information will be displayed, while unknown components will have the filename. Clicking on the component will display the [Component Detail Page](#).

Affected Apps

The sum of applications that are affected by a policy violation due to this component.

Tip

Clicking on this value will open the Component Detail Page.

Total Risk

The sum of the threat level for each policy the component has violated. In cases where the same violation is found in multiple stages, only the newest violation is included in this total.

Critical

The sum of the component's policy violations with a threat level of eight or higher.

Severe

The sum of the component's policy violations with a threat level higher than three, but less than eight.

Moderate

The sum of the component's policy violations with a threat level higher than one, but less than four.

Low

The sum of the component's policy violations with a threat level of one.

Tip

Remember, if your filters exclude data in any of these categories, this information will not be displayed.

5.3.3.3 By Application

This view displays the first 100 highest risk applications based on any filters that have been set, and your level of access.

APPLICATION	TOTAL RISK ▾		CRITICAL	SEVERE	MODERATE	Newest	By Component	By Application
	BUILD	STAGE RELEASE						
MyApplication	2217	2097	102	18				
	1128	1062	54	12				
	1132	1062	78	12				
My Application 2	98	36	54	8				
	1267	988	183	118				
	973	687	171	115				
My Application 3	973	687	171	115				
	925	715	122	88				
	583	387	108	88				
My Application 4	983	387	108	88				
	983	387	108	88				
	713	527	98	88				
BUILD		517	338	91	88			
STAGE RELEASE		517	338	91	88			
Showing the top 100 results								

Figure 5.11: Highest Risk - By Application

Note

By default only policy violations greater than 1 (i.e. all but low/blue) are displayed and included in the calculations. Given that data excluded by filters is not displayed on the dashboard, the *Low* violations column will not be present. This can be modified by setting the Policy Threat Level filter to include violations below these levels (0/1).

Like a component, risk for an application is associated with the threat level of a policy. In the case of application risk, it is the sum of policy threat levels that correspond to unique policy violations for the components in an application.

This produces a total count by stage. The unique occurrences are then added together to create the total risk of an application. Put another way, application risk is the sum of all unique policy violation threat levels across all stages and policies the application is evaluated against.

Similar to the *By Component* view, for all calculations, a violation is only counted once. When there are multiple instances of the same violation, only the most recent violation is counted, regardless of stage. Because of this, in cases where a policy has been changed in between evaluations, only the violation from the most latest evaluation will be included. This will be true, even if the change to the policy included threat level.

Given the logic behind the calculation, risk is then broken down into five columns (six when low violations are included). Each application record can also be expanded to see the risk breakdown by stage.

Tip

Click on the stage name to see the most recent Application Composition Report for the corresponding application and stage.

For additional detail, take a look at the descriptions of each column below.

Application

The name of the application is displayed here. Click the expand icon (the small triangle icon), to display the results for each stage.

Total Risk

The sum of the threat levels for all policy violations in the application. In cases where the same violation is found in multiple stages, only one violation is included in this risk score.

Critical

The sum of policy violations in the application with a threat level of eight or higher.

Severe

The sum of policy violations in the application with a threat level higher than three, but less than eight.

Moderate

The sum of policy violations in the application with a threat level higher than one, but less than four.

Low

The sum of the component's policy violations with a threat level of one.

Tip

Remember, if your filters exclude data in any of these categories, this information will not be displayed.

5.4 Viewing Component Details

As components are used across various applications, and then evaluated with Sonatype CLM, it is very likely some of those components will violate your policies. When violations occur, this creates risk. The Component Detail page presents the known coordinates for the component and then below this, all violations that have been found, organized by application. In addition, risk information for each component is provided.

Clicking on the icon to the top left of each application name will expand or collapse the detail for all policy violations related to the corresponding component and application.

commons-fileupload :commons-fileupload:1.2.2						TOTAL RISK 1040
APPLICATION	SHARE OF RISK	RISK	BUILD	STAGE	RELEASE	OPERATE
My Organization : MyApplication	2%	16	4m	4m		
9 Security-High	1%	9	4m	4m		
7 Security-Medium	1%	7	4m	4m		
My Organization 3 : My Application 4	2%	16	5m			
9 Security-High	1%	9	5m			
7 Security-Medium	1%	7	5m			
My Organization 4 : My Application 2	2%	16	3m	3m		
9 Security-High	1%	9	3m	3m		
7 Security-Medium	1%	7	3m	3m		

Figure 5.12: Component Detail Page

Similar to previous views, separate columns display pertinent information related to the component and violations associated with each application it is used in. These have been described in additional detail below.

Application

The name of application, preceded by its parent organization.

Share of Risk

The share of risk is displayed as a total for the application, as well as a breakdown for each violated policy.

For the Application

This is the percentage of risk for the displayed component in relation to a specific application. It is calculated by taking the sum of the threat levels for policies an application is evaluated against (and the component has violated), and then dividing by the sum of threat levels for all policies violated across all applications displayed.

For the Policy

This is the percentage of risk for a particular policy violation as it relates to the total risk for the component. It is calculated by taking the threat level of the violated policy, and dividing it by the sum of the threat levels for all violated policies for the displayed component and applications.

Risk

Risk represents the sum of the threat levels for the policies the component has violated.

CLM Stages

The CLM stages follow the four stages that Sonatype CLM employs (Build, Stage (Stage Release), Release, Operate). The amount of time that has passed since discovery of the component in violation of a policy will be displayed in the corresponding column and row. Abbreviations for time is as follows:

- min = minute
- h = hour
- d = day
- m = month
- y = year

In addition, if any actions were taken in the stage (i.e. warn or fail), an icon will be displayed.

Tip

Clicking on the time stamp for the violation will open the most recent [Application Composition Report](#) for the corresponding component and application.

5.5 Conclusion

This guide covered one of the most important tools that Sonatype CLM delivers, the Dashboard. A range of topics included:

- Access
- Filters
- Policy Violation Visualizations
- Detailed Component Information

What may have been a more subtle theme is that the Dashboard provides a place to gauge the effectiveness of your policies, as well as the processes that encompass the uniqueness of your development and component lifecycles. That is, the Sonatype CLM Dashboard is a good starting point for everything you do with the Sonatype CLM suite of products.

However, the most important takeaway is that the Dashboard, to truly be effective, serves as the initial point and driver for communication. This can be for both training and improving your development teams, as well as demonstrating the effectiveness of CLM to critical members of your leadership.

Through all of this, keep in mind that in the beginning, violations will likely be high, and the perception of quality low. This is OK and natural; it will reverse over time. Don't get discouraged, and as with all things, a little bit of time can make all the difference.

Chapter 6

Sonatype CLM and Continuous Integration

6.1 What is Continuous Integration (CI)?

The idea of continuous integration is that software development efforts are much easier to manage when test failures and other bugs can be identified closer to the time they were introduced into a complex system. As a consequence the differences between the working and the failing system are smaller and therefore easier to detect.

The term continuous integration was coined by Martin Fowler and Kent Beck in their book *Extreme Programming Explained* published 1999. They introduced the idea of creating a system that continuously builds your software and executes any tests against it on a regular base as well, all in response to any changes of the source code.

Since its introduction, usage of continuous integration servers became an established and well understood best practice across the entire software development industry.

A number of commercial as well as open source servers are now available for installation in your own infrastructure as well as a managed service running remotely. Typical CI installations are often comprised of a number of servers running the actual build and being orchestrated by one master and build running on the CI servers range from simple compile builds to running large integration test suites or regression

tests in an automated fashion. In addition CI servers are increasingly used for continuous deployment, where a series of successful build and test runs results in actual production deployment of the software.

6.2 Sonatype CLM and Continuous Integration

Sonatype CLM can analyze the components used in your software development for security and license characteristics. When integrated with a continuous integration server it becomes a dynamic analysis performed on a regular basis occurring potentially with each build running on the server.

Depending on your application server software you can use the Sonatype CLM for CI plugin available for Hudson and Jenkins, the Sonatype CLM command line scanner or the Sonatype CLM Maven plugin. Every one of these tools allows you to perform a full security and license analysis of the artifacts produced by the configured build backed by your Sonatype CLM server. It will provide you access to the analysis report.

6.3 Sonatype CLM for Hudson and Jenkins

6.3.1 Introduction

Eclipse [Hudson](#) and [Jenkins](#) are powerful and widely used open source continuous integration servers providing development teams with a reliable way to monitor changes in source control and trigger a variety of builds. They excel at integrating with almost every tool you can think of.

Historically the Hudson project and community split into two groups, with Jenkins as well as Hudson emerging as sibling products with a different focus going forward while sharing a common API for plugins. In general, with regard to the Sonatype CLM for CI functionality, the interaction will be near identical, with only a few differences, which are inherent to the CI, and not Sonatype CLM.

Sonatype CLM for Hudson and Jenkins evaluates the project workspace after a build for all supported component types, creates a summary file about all the components found and submits that to the Sonatype CLM service. The service uses that data to produce the analysis with the security and license information and send it back to the CI server. It will then use these results to render the analysis reports.

The file types supported for analysis are in tar/zip like format with the extensions tar, tar.bz2, tb2, tbz,

tar.gz, tgz and zip or in Java archive formats of the type jar, ear, war, hpi, wsr, har, sar, rar, mar and nbm.

6.3.2 Installation

Sonatype CLM for Hudson and Jenkins is distributed as a Hudson plugin package (.hpi file) and is compatible with Jenkins and Hudson.

In order to install the plugin you have to log into Jenkins or Hudson as administrator and then select to *Manage Jenkins/Manage Hudson* to get to the global configuration menu displayed in Figure 6.1 in the Jenkins look. The Hudson look will be similar in content, yet different in colors and styling.



Figure 6.1: Jenkins Global Configuration Menu

From the displayed configuration menu, select *Manage Plugins* and in the plugin management section, choose the *Advanced* tab.

The advanced plugin management allows you to upload a plugin distribution file (.hpi) in the section entitled *Manual Plugin Installation* on Hudson and *Upload Plugin* on Jenkins. Click on *Choose File* and select Sonatype CLM for Hudson and Jenkins hpi file named sonatype-clm-ci-x.y.z.hpi with x.y.z representing a version number like 2.11.2 in the file selection dialog. Then press the *Upload* button. Once the plugin has been uploaded to the server, you need to restart your continuous integration server.

6.3.3 Global Configuration

After a successful installation of Sonatype CLM for Hudson and Jenkins, a new option will be available in the Jenkins/Hudson management area, *Configure Sonatype CLM for CI*. Follow these instructions to configure Jenkins or Hudson to connect to your Sonatype CLM Server.

The screenshot shows the 'Configure Sonatype CLM for CI' page. It has a header with a blue bar chart icon and the title 'Configure Sonatype CLM for CI'. Below the header, there are two main sections: 'Sonatype CLM server settings' and 'Global mask options'. The 'Sonatype CLM server settings' section contains fields for 'Server address' (http://localhost:8070/), 'Username' (Jenkins_User), and 'Password' (redacted). The 'Global mask options' section contains a checkbox for 'Anonymize paths'. The 'Global path options' section contains fields for 'Scan targets' and 'Module excludes'. At the bottom right is an 'Advanced...' button, and at the bottom left is a 'Save' button.

Figure 6.2: Global Configuration of Sonatype CLM for CI in Jenkins

Sonatype CLM server settings (required)

Server address

This is the address for the Sonatype CLM server as it can be reached from the Jenkins/Hudson server. By default, the Sonatype CLM Server address is `http://localhost:8070`.

If your Sonatype CLM server is behind a proxy server for serving HTTPS or other reasons, you have to use the public URL as it is reachable from the continuous integration server. Only

the master Jenkins/Hudson server connects to the CLM server and you therefore only need to ensure connectivity in terms of open firewall ports and proxy server settings between the master CI server and the CLM server.

Username

This is the username you wish to use to connect to the CLM Server. Since these settings will be used across all projects for your Jenkins/Hudson installation, we suggest creating a single account on the Sonatype CLM Server for Jenkins/Hudson, and then associating that account with the Application Evaluator role for the Organizations or Applications you will be linking to Sonatype CLM for Hudson/Jenkins.

Password

The password for the username entered above.

Tip

Username and password can also be configured [per job](#).

Global mask options

Anonymize paths

Enabling this feature will anonymize all paths before data is sent to the Sonatype CLM server. Ultimately, this prevents the CLM report from reporting the locations/occurrences of components.

Global path options

Scan targets

The scan targets setting allows you to control which files should be examined. The configuration uses an [Apache Ant styled pattern](#), is relative to each project's workspace root directory, and has a useful default setting that includes all jar, war, ear, zip and tar.gz files. The default value is therefore

```
**/*.jar, **/*.war, **/*.ear, **/*.zip, **/*.tar.gz
```

Note

This default only applies if, and only if, neither global nor job config specify scan targets. Adding to this, if you are using a private Maven repository, our default pattern will include your entire Maven repo. This could greatly increase the time necessary for your evaluation, as well as skew evaluation results. To avoid this, consider using a more specialized pattern like `*/target/*.jar`.

Module excludes

If you are using Sonatype CLM for Maven, you may have noticed the creation of module information files. The process for excluding modules is documented in the [Excluding Module Information Files in Continuous Integration Tools](#) section of the Sonatype CLM for Maven Guide.

Advanced options

A number of additional parameters can be supplied to the plugin using this input field. Typically these parameters will be determined by Sonatype support.

6.3.4 Job Configuration

After a completed installation (see Section 6.3.2) and global configuration (see Section 6.3.3) of Sonatype CLM for CI, you are ready to configure an invocation as part of a specific job.

Depending on your job type it will be available as pre and/or post-build step as well as a invocation as a main build step. The typical invocation would be as main build step, after the package that should be examined has been created. An example configuration from Jenkins is displayed in Figure 6.3. Alternatively a post-build step for example as displayed in Figure 6.4 can be used as well. A pre-build step or a main build step executed before your main build invocation step could be used to examine components existing in the workspace or being placed into the workspace by an earlier build step.

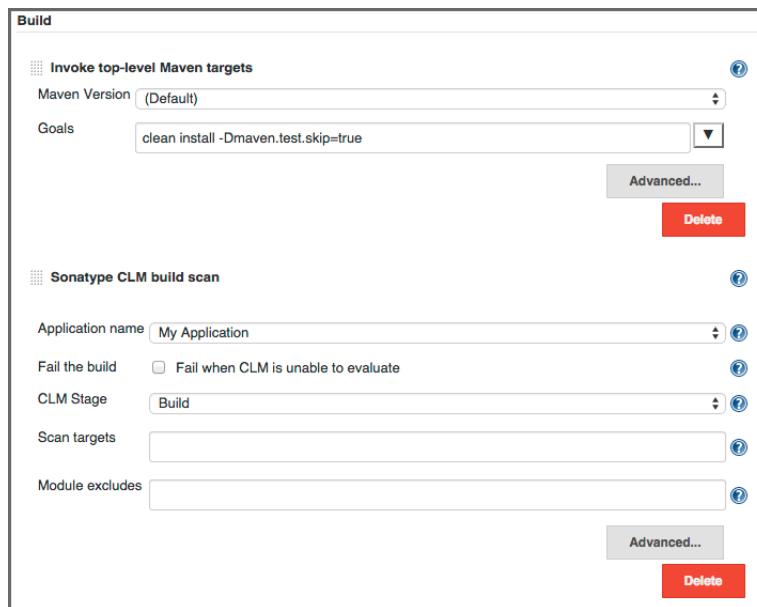


Figure 6.3: Sonatype CLM Build Scan Configuration for a Build Step

The configuration options for Sonatype CLM for CI invocations mimic the parameters from the global

configuration described in Section 6.3.3 and are appended to the global parameters. The configuration parameters are:

Optional Job Specific Authentication

While username and password can be [configured globally](#), in some cases you may want a certain job to be associated with a user who has permissions to specific Organization and/or Applications. Job Specific Authentication allows you to configure a user for this job and use the associated permissions to select the Application for the evaluation.

Username

the Sonatype CLM Server username you wish to use for this job.

Password

the password for the username above.

Sonatype CLM Job Configuration

Application name

The drop down for application name should be populated with the name of all applications configured in your Sonatype CLM server and allows you to select the desired application scanning configuration. The policies associated to the application will be used for the analysis of this build job output.

Fail the build

Check this option if you want to fail the build when a CLM evaluation can't be performed. Once checked, if for any reason the evaluation is not generated, the build will be failed.

An example of this might be if the CLM server is inaccessible. In this scenario, the build would fail. In the same example, but where the *Fail the build* option is left unchecked, the build would be marked unstable.

CLM Stage

This corresponds to the stage you wish the policy evaluation of the application/project to be run against. Additionally, this will correspond to the stage location when viewing report information via the CLM Server (e.g. if you chose the Build stage, summary and dashboard violation results will be displayed accordingly).

Note

Depending on how your policies are configured, this may impact warning and fail actions.

Scan targets

The scan targets setting allows you to control which files should be examined with an Apache Ant styled pattern. The pattern is relative to the project workspace root directory and inherits the global configuration.

Module excludes

You can exclude modules from being scanned with module information files configured in this setting. The default value is inherited from the global configuration.

Advanced options

A number of additional parameters can be supplied to the plugin using this input field. Typically these parameters will be recommended to you by the Sonatype support team.

The screenshot shows the 'Sonatype CLM build scan' configuration page. It includes fields for 'Optional Job Specific Authentication' (Username: MyUsername, Password: redacted), 'Sonatype CLM Job Configuration' (Application name: My Application (MyAppID), Fail the build: checked, CLM Stage: Build, Scan targets: redacted, Module excludes: redacted), and an 'Advanced' button.

Figure 6.4: Post-build Action Configuration as Example for a Sonatype CLM for CI Configuration

6.3.5 Inspecting Results

Once a specific build has successfully completed, Sonatype CLM for CI provides a link to the application composition report in the job list in the *Policy Violations* column as well as the project specific overview page. Clicking on the link *Application Composition Report*, will direct you to the display of the report within the Sonatype CLM Server. The three boxes (red, orange, and yellow) located below the link, give you counts for policy violations, and are based on the associated severities (high, medium, and low).

In addition to the link to the report, the left-hand menu for the job includes *Application Management*. Clicking on the link will take you directly to the specific application on the Sonatype CLM Server. In Figure 6.5 you can see both the link to the report, and the link to Application management.

Note

Accessing this information may require a login. Also, if you are using a version of Sonatype CLM for Hudson and Jenkins prior to version 2.11, and Sonatype CLM Server 1.7, a message will display indicating your report has been moved. Following this link will take you to the report on the Sonatype CLM Server.

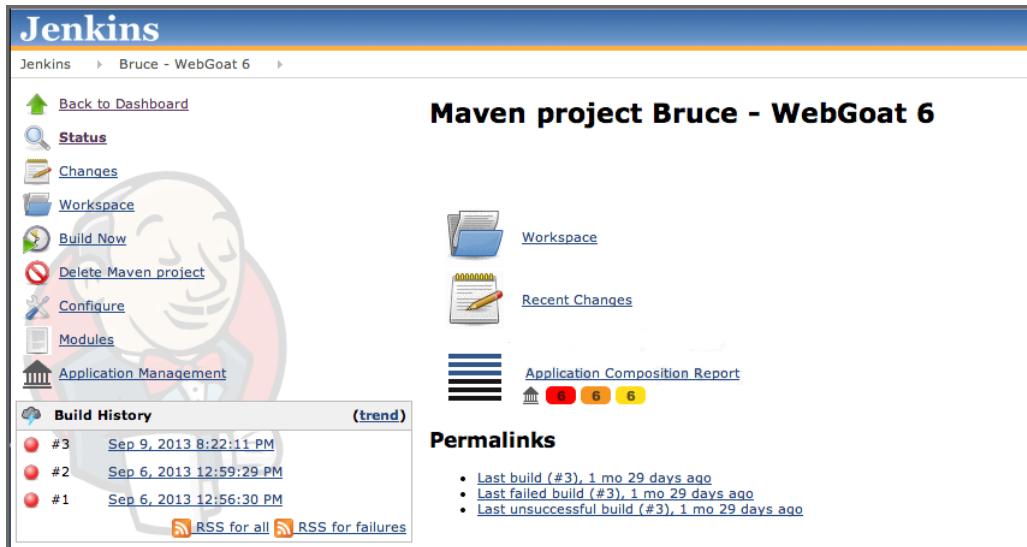


Figure 6.5: Job Overview Page with Links to the Application Composition Report and Application Management

If you are looking for previous report results, simply navigate to a specific build in the *Build History*. If you have previously scanned the application during that specific build, you will see a new item in the left menu, *Application Composition Report*. As with the report link above, you will be taken to the Sonatype CLM Server to review the results. An example is show in Figure 6.6 below.

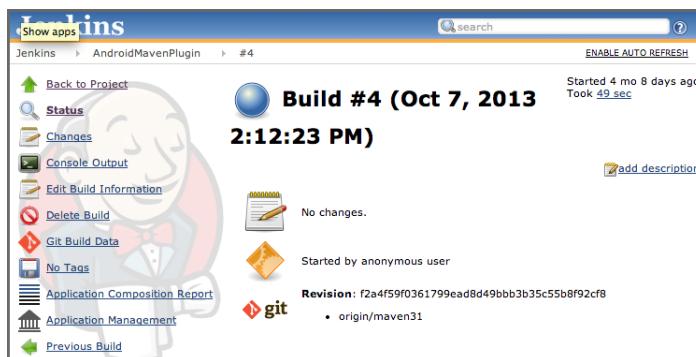


Figure 6.6: Left Menu with Link to the Application Composition Report

6.3.6 Conclusion

You should now have Sonatype CLM for Hudson and Jenkins up and running. Just in case you missed something, here are some highlights if what was covered:

- Requirements, Installation and Configuration
- Job Configuration
- Inspecting Results

If you haven't already, you will want to take a look at the [Policy Management](#) guide. Plus don't forget if your organization uses multiple CI systems, many of these can be integrated using the Sonatype CLM for CLI or Maven tools.

6.4 Sonatype CLM and Other CIs

If you are looking for information on integrating Sonatype CLM with other Continuous Integration servers, please review the information in our chapters covering [Sonatype CLM for CLI](#) or [Sonatype CLM for Maven](#).

6.5 Conclusion

If you're not already using a CI Server, this chapter should provide some strong encouragement to look into going this route. It's our feeling that in order to get a complete Sonatype CLM experience and ensure that your component lifecycle processes sync with your development processes you will want to make sure you integrate the Sonatype CLM functionality for your CI Server.

For those of you that are already using a continuous integration (CI) server, you already realize the benefits that this provides to your team. In this chapter you should have taken away:

- Identify the CI tools supported by Sonatype CLM
- Installation and configuration instruction for Sonatype CLM supported CI Servers.

Again, this is a completely optional part of Sonatype CLM, but it is our recommended approach. Given this, not interfacing with a CI server won't prohibit you from achieving success, it just makes it a little difficult.

Chapter 7

Sonatype CLM for IDE

7.1 Introduction

An Integrated Development Environment, or IDE for short, is a software developer's workbench. It typically provides features to assist a developer in all their activities writing and maintaining software.

These include:

Powerful code editing features

with syntax highlighting, code completion and others helpful tools for efficient editing.

Integration of development tools

like compilers, debuggers, and profilers.

Support for version control systems

including tasks like checkout, commit, update and others.

Integration with language specific libraries

for accessing help, browsing libraries, completing code.

Build automation

within the tool e.g. for incremental compile as well as support for external build tools.

Testing support

for unit and integration test authoring and execution.

Integration with other software development tools

like code review systems, continuous integration servers, or repository managers.

The aim of an IDE is to maximize the productivity of a software developer during the entire software development process. Thus, an increasingly important part of these tasks is understanding, controlling, and managing the components that are part of your software product. This also includes carrying out the component lifecycle management related tasks like assessing security and license issues, as well as ensuring your component is using the best version possible.

Note

At this time, Sonatype CLM only supports the Eclipse IDE as a direct add on. However, other IDEs can be integrated using [Sonatype CLM for Maven](#).

7.2 Installing Sonatype CLM for Eclipse

Often only called Eclipse, the [Eclipse IDE](#) is a very powerful, open source IDE written mostly in Java and managed by the [Eclipse Foundation](#). It can be used for development in a number of languages, and is the most widely used IDE for Java development. It features a powerful plug-in system that allows you to customize the IDE, with features that support a large number software development-related tasks including localization options, version control systems, and myriad of other tasks.

Sonatype CLM for Eclipse requires Eclipse 3.7 or higher. In addition it requires the [Maven integration for Eclipse m2e](#) to be installed. Most Eclipse download bundles related to Java development include this integration. If your Eclipse version does not have m2e installed, you need to install it before installing Sonatype CLM for Eclipse following the instructions on the [m2e site](#).

Sonatype CLM for Eclipse can be installed by adding a new software repository. Navigate to the *Help* menu and select *Install New Software*. Press the *Add* button in the dialog displayed in Figure 7.1 and create a new repository with the *Location* set to the URL for Sonatype CLM for Eclipse releases from [URL for the Sonatype CLM for Eclipse repository](#) and a *Name* of your choice. Once you press *OK* a list of available releases is downloaded and an entry for the latest version of Sonatype CLM for Eclipse is displayed. Uncheck the item *Show only the latest versions of available software*, if you need to install an older release. Figure 7.1 shows a list of releases available.

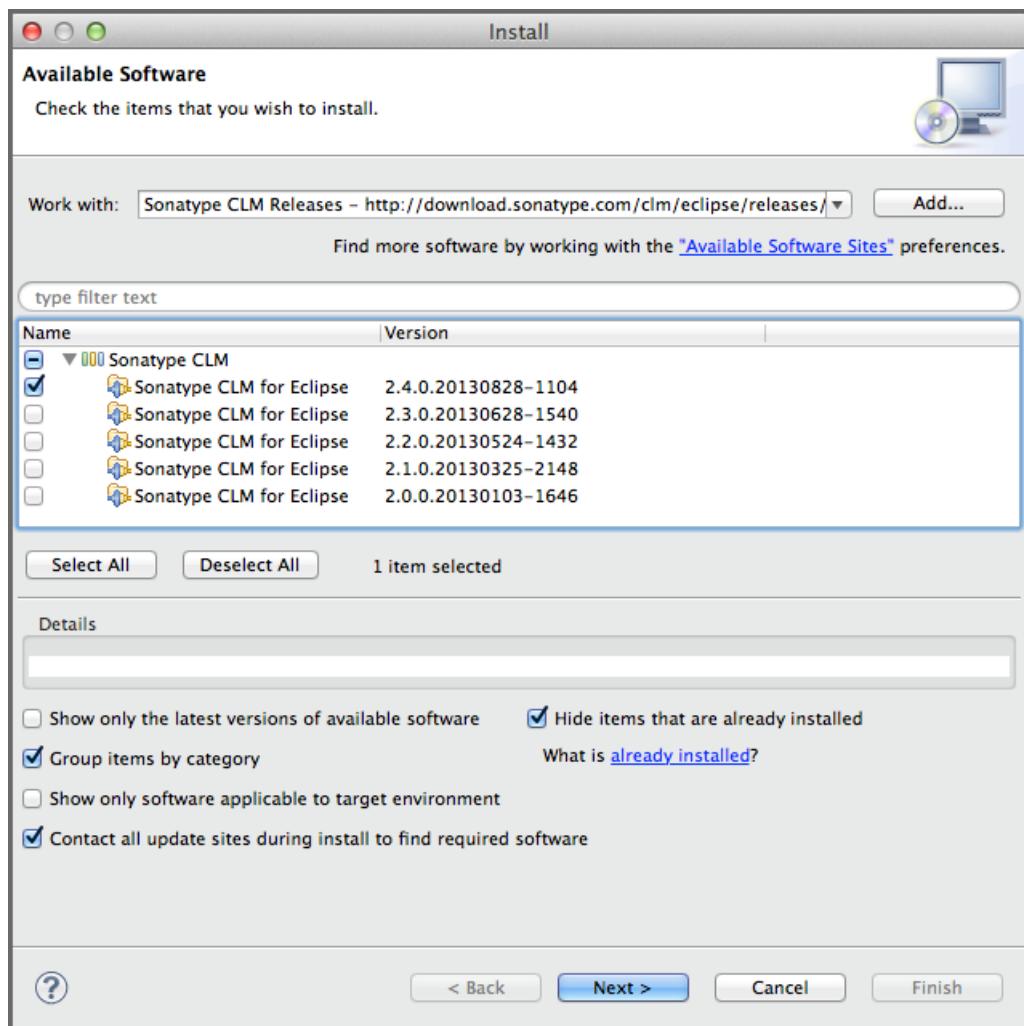


Figure 7.1: Eclipse Dialog to Install New Software with Sonatype CLM for Eclipse

URL for the Sonatype CLM for Eclipse repository

`http://download.sonatype.com/clm/eclipse/releases/`

Select the version of Sonatype CLM for Eclipse you would like to install and press *Next >*, proceed through accepting the end user license agreement and restart Eclipse to complete the installation.

7.3 Configuring Sonatype CLM for Eclipse

After successful installation of Sonatype CLM for Eclipse, you will be able to choose to show the Sonatype CLM view displayed in Figure 7.2.

To access this view:

1. Choose the *Window* menu and select *Other* in the *Show View* submenu.
2. Locate the *Sonatype CLM* section with *Component Info* as shown in Figure 7.2.
3. Select it and press *OK* and the view will appear in your IDE.

Tip

By typing "Compo" in the filter input, Component Info is automatically highlighted.

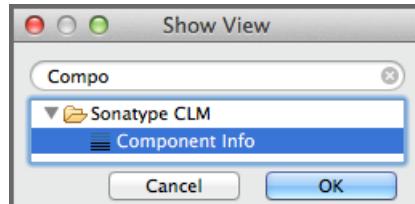


Figure 7.2: Activating the Component Info View of Sonatype CLM for Eclipse

Once the view is displayed, a warning will appear. This is because the you need to point Eclipse at your Sonatype CLM Server.

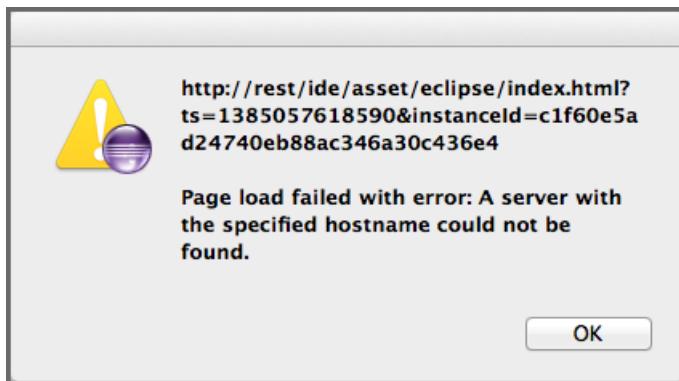


Figure 7.3: Warning after initial installation

To configure the Sonatype CLM for Eclipse plugin, simply press the  *Configure* button in the top right-hand side of the component view.

Once in Sonatype CLM for Eclipse Configuration area, there are a number of parameters you will need to complete before you can review data from Sonatype CLM. These are covered below.

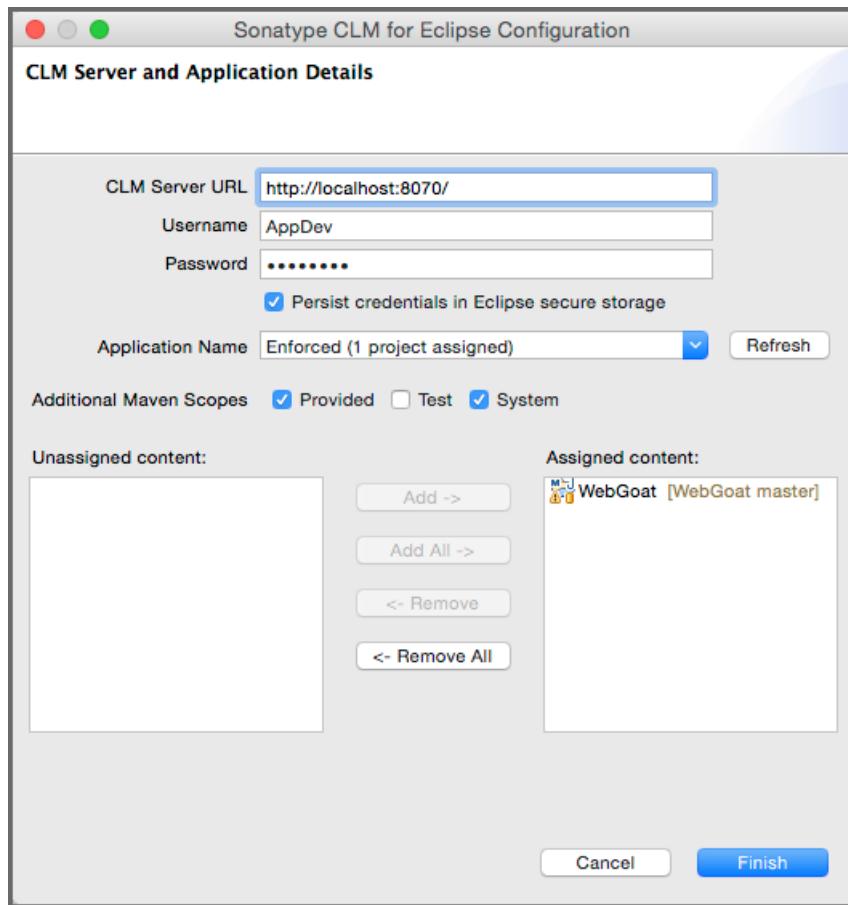


Figure 7.4: Sonatype CLM for Eclipse Configuration Dialog

CLM Server URL

The *CLM Server URL* input field has to be configured with the URL of your Sonatype CLM server.

Username and Password

This is the username and password your Sonatype CLM Administrator has assigned you. In many cases this will simply be your single sign on credentials (e.g. LDAP), though it may also be a unique username. Again, your administrator will advise you of this login information.

Note

Selecting the option to persist credentials in Eclipse secure storage will reuse your credentials after a restart. If this is not selected you will need to reenter your credentials after a restart.

Application Name

The *Application Name* is the application which has been configured in the CLM server for you. This should match the common name you associate with the application. If you don't see a name you recognize, contact your Sonatype CLM Administrator.

Note

The drop down will display a list of all available applications after pressing the *Refresh* button.

Additional Maven Scopes

The compile and runtime scopes will always be considered. Additional scopes (provided, test, and system) you would like CLM to include can also be selected.

Assigned vs. Unassigned Content

After selecting an application name that represents a collection of policies configured in your CLM server, you can determine the Eclipse projects that should be analyzed. The list on the left titled *Unassigned content* contains all projects in your current Eclipse workspace that have not been assigned to a Sonatype CLM Application. Select a project from that list and add it to the *Assigned content* list on the right by clicking the *Add* button. This will add the project to the component analysis via the CLM server. In order to perform an analysis, the project needs to be open. To select multiple projects use the Shift and Control keys, and then click the *Add* button. The *Add All*, *Remove* and *Remove All* buttons help you to control the projects to analyze for different analysis sessions.

Note

Projects can, at most, be assigned to a single application.

With a finished selection of the projects you want to analyze, press the *Finish* button and wait for the component list to be displayed in the view. Section 7.4 documents how to inspect the results of the analysis and further features available from this information.

Tip

Only open projects will be taken into account as part of the component analysis.

7.4 Using the Component Info View

7.4.1 Overview

Once configured and the component analysis is completed a component view will look similar to the example displayed in Figure 7.5. The list of components will reflect an analysis of the build path.

Note

For Maven projects we include the compile and runtime scopes in the CLM evaluation. If you wish to include additional dependencies found in provided, test, and system scope, these can be [configured](#).

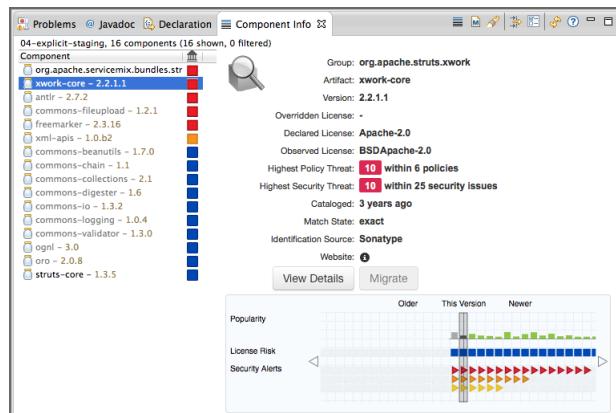


Figure 7.5: Example Component Info View

The top left-hand corner of the Sonatype CLM for Eclipse *Component Info* view displays either the number of projects currently being examined in the view, or the name of the specific project. Next to that, the number of components found, and the number of components shown in the list is displayed.

The top right-hand corner provides a number of buttons to access the following features of Sonatype CLM for Eclipse:

**Open Component Details**

Opens another window with more details about the selected component including policy violations, license analysis and security issues.

**Open POM**

Opens the Maven pom.xml file of the selected component from the list in the Maven POM Editor.

**Locate Declarations**

Starts a search, that displays all usages of a selected component in the projects currently examined as documented in Section [7.4.3](#).

**Filter**

Brings up the filter selection, that lets you narrow down the number of components visible in the view as documented in Section [7.4.2](#).

**Configure**

Activates the configuration dialog for the component analysis.

**Refresh**

Refreshes the component list and analysis results.

**Show information about the plugin**

Displays the Sonatype CLM for Eclipse support pages in an external browser.

**Minimize**

Minimize the view.

**Maximize**

Maximize the view.

The left-hand side of the view contains the list of components found in the project and identified by their artifact identifier and version number. A color indicator beside the components signals potential policy violations. The right-hand side of the view displays the details of the selected component from the list on the left.

Tip

You may notice some components are black or gray. This indicates components you have included (black) in your application, versus components that are included via a transitive dependency (gray).

By clicking on the list header on the left, the list can be ordered by the threat level of the policy a component has violated. In cases where there is no violation, the threat is simply light blue.

When you select a specific component in the list, the details, various properties, and a visualization of the different versions is displayed to the right of the list.

Tip

Depending on your screen size, the visual display may be shown below the component list. Try adjusting your screen size, or adjusting the panel.

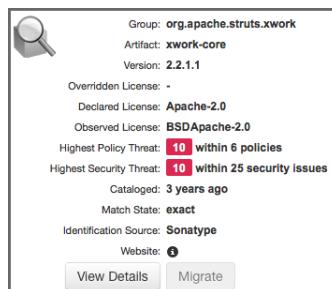


Figure 7.6: Details for a Component in the Component Info View

The details of a specific component as displayed in Figure 7.6 include properties about the component and provide access to further features:

Group

The Maven `groupId` the component was published with. In many cases this is equivalent with the reverse domain name of the organization responsible for the deployment or running the project.

Artifact

The Maven `artifactId` of the component acts as a short and ideally descriptive name.

Version

The Maven version of the component. A version string ending in -SNAPSHOT signifies a transient, in development version, any other version is a release version.

Overridden License

The value of a license override configured in your Sonatype CLM server.

Declared License

The software license declared by the developer of the project, which in some cases, is identified during research by Sonatype, or directly from the Maven POM file.

Observed License

The licenses found by the Sonatype CLM server in a source code analysis.

Highest Policy Threat

The highest threat level policy that has been violated, as well as the total number of violations.

Highest Security Threat

The highest security threat level as well as the number of issues found with the respective level.

Patch Available

This is a future feature that will provide details in instances where a patch is available. Patches will be provided and verified by Sonatype.

Cataloged

The age of the component in the Central Repository.

Identification Source

The catalog in which a component identification match was found. This includes either a match made by Sonatype (e.g. the catalog of the Central Repository), or a match made manually (i.e. through the Sonatype CLM claiming process).

Website

If available, an information icon providing a link to the project is displayed.

View Details

Press this button to display the details view for the selected component as detailed in Section 7.4.4.

Migrate

Press this button to start a project refactoring that allows you to change all usages of the current component to a different version as documented in Section 7.5.

Custom Metadata

This is a future feature that will allow you to display all custom metadata tags assigned to the component.

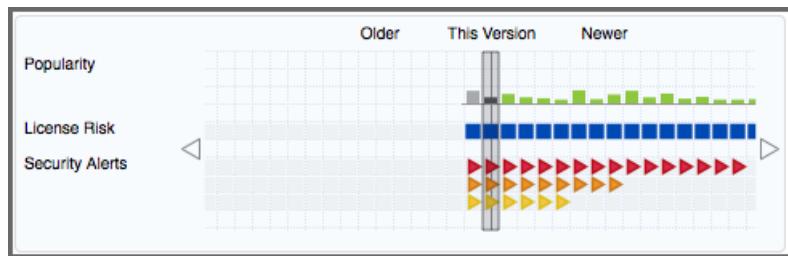


Figure 7.7: Properties of a Component for a Version Range

The visualization chart displayed in Figure 7.6 shows a number of properties for different, available versions of the selected component. Older versions are displayed on the left and newer versions on the right. Click on any section in the visualization, and all information for that particular version will be highlighted, with the specific version number at the bottom. In addition, the details for that version of the component will display in the left-hand list of properties. Arrows to the left and right of the visualization allow you to view the full range of available versions.

The properties displayed include:

Popularity

the relative popularity of a version as compared to all other component versions

License Conflict

displays an indicator, if the observed licenses in the component are creating a legal conflict, e.g. GPL V2 and Apache V2 are not compatible for distribution of one component

License Risk

the risk posed based on what has been set within the license threat groups. While defaults are available, these are configurable via the Sonatype CLM Server.

Security Alerts

indicators for the severity of security alerts affecting the component version

You will likely notice a number of colors within the visualization chart. The value for each of these colors is as follows:

For Popularity

- Grey for any versions older than the current version.

- Green for newer, but within the same major version of the component.
- Blue for newer component versions, but with a greater major version than the current component.

For License and Security

- Blue - no security or license risk
- Yellow - minor security or license risk
- Orange - medium security or license risk
- Red - severe security or license risk

7.4.2 Filtering the Component List

The list of components found in the analysis and displayed in the component info view can be configured by pressing the  *Filter* button. The filter dialog, displayed in Figure 7.8, allows you to narrow down the components shown.

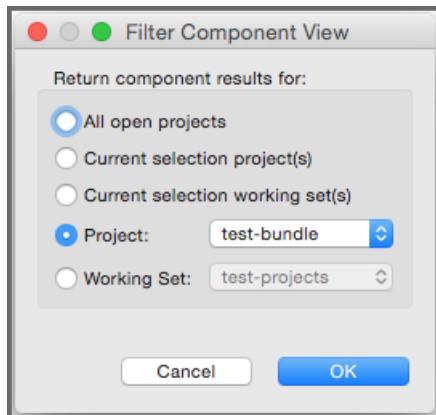


Figure 7.8: Filter Dialog for the Component Info View

The *Scope* setting determines, which projects' components are displayed in the list:

All open projects

include all the components, from all open projects

Current selection project(s)

include the components from the project currently selected in the package explorer

Current selection working set(s)

include the components from all the projects in the working set currently selected in the package explorer

Project

include the components from the project selected in the drop down

Working Set

include the components from all the projects in the working set selected in the drop down

7.4.3 Searching for Component Usages

Once you have selected a specific component in the list on the left of the component info view, Sonatype

CLM can determine in which projects the component is used. After pressing the  *Locate Declarations* button, and once the search has completed, you will see the results in a tree view of projects and project pom.xml files, all displayed in the *Search* window.

Inspecting this list can help you assess the impact of a potential upgrade to a new component version. Further detail is documented in Section 7.5. Looking at the found projects, you can potentially remove wrong declarations, determine side effects from transitive dependencies, or find out why this component shows up as dependency at all.

7.4.4 Inspecting Component Details

Press the  *Open Component Details* button in order to access the details about policy violations, license analysis and security issues for a specific component selected in the list. Figure 7.9 displays an example details view.

Policy Violations		
Policy	Constraint	Summary
Security-High	CVSS >=7 and <10	Found 2 Security Vulnerabilities with Severity >= 7
		Found 2 Security Vulnerabilities with Severity < 10
		Found 2 Security Vulnerabilities with Status OPEN
Architecture-Quality	Old	Age was 7 years, 5 months and 24 days

License Analysis		
Threat Level	Declared License(s)	Observed License(s)
Liberal	BSD-3-Clause	BSD

Security Issues			
Threat Level	Problem Code	Status	Summary
9	CVE-2007-4575	Open	HSQLDB before 1.8.0.9, as used in OpenOffice.org (OOo) 2 before 2.3.1, allows user-assisted remote attackers to execute arbitrary Java code via crafted database documents, related to "exposing static java methods."
	OSVDB-40548	Open	OpenOffice.org (OOo) HSQLDB Database Document Handling Unspecified Arbitrary Java Code Execution

Figure 7.9: Example Component Details Display

The *Policy Violations* section in the top contains a list of all the policies that have been violated by the component.

The *License Analysis* section contains the *Threat Levels* posed by the licenses declared for each component, as well as those that have been observed in the source code.

The *Security Issues* section below contains the list of issues found. They are sorted from higher to lower risk, with each issue detailed by a *Threat Level* ranging from 0 to 10, or potentially with the value *Unscored* and a descriptive text in the *Summary* column. In addition, links to the security vulnerability database entry are added as links in the *Problem Code* column.

7.5 Migrating to Different Component Versions

If you determine that a component upgrade is required to avoid a security or license issue or a policy violation, after reviewing your component usage, Sonatype CLM for Eclipse can be used to assist you in the necessary refactoring.

NOTE

This feature relies on the project being a Maven project.

The first step to start the migration is to select a newer version for the component in the visualization chart. An example is displayed in Figure 7.10.

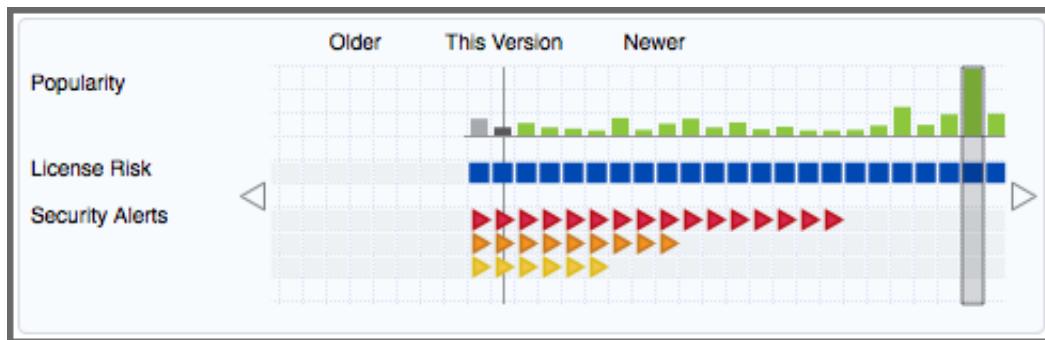


Figure 7.10: Migrating to a Newer Component Version

Once you have selected a different version than the one currently used, the *Migrate* button will become active. Pressing the button opens a dialog that assists you in the migration to the newer component. The complexity of this task varies considerably from project setup to project setup. The migration wizard is able to detect circumstances such as the component being a transitive dependency or versions managed in a property.

The simplest flow is when a dependency version can be applied, and the result is a single dialog like the one displayed in Figure 7.11.

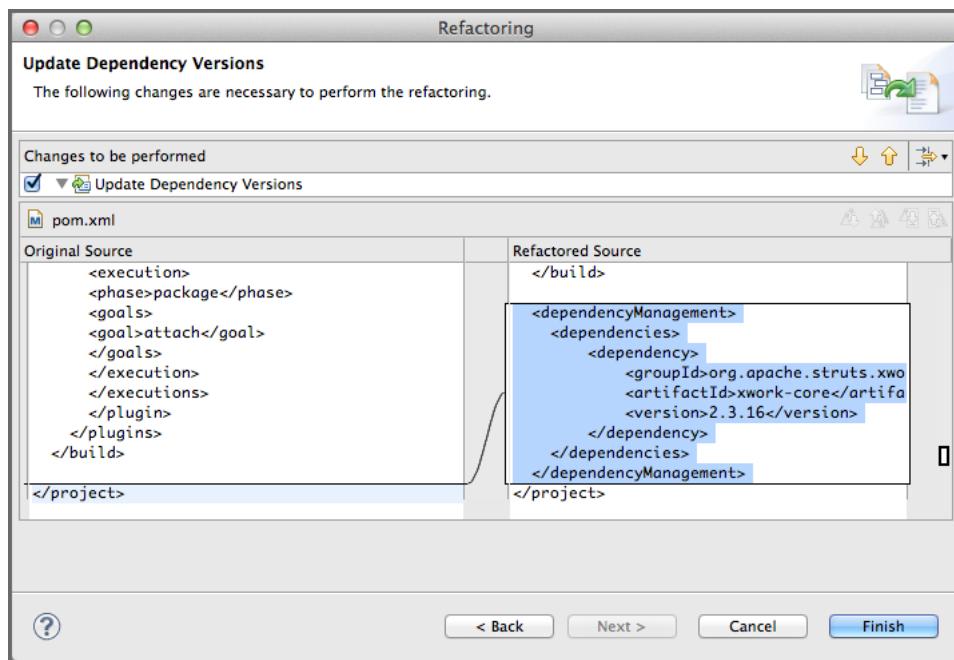


Figure 7.11: Applying a Dependency Version Upgrade

If the version is managed in a property, the initial screen from Figure 7.12 allows you to select if you want to continue with a property upgrade, or perform a replacing version upgrade.

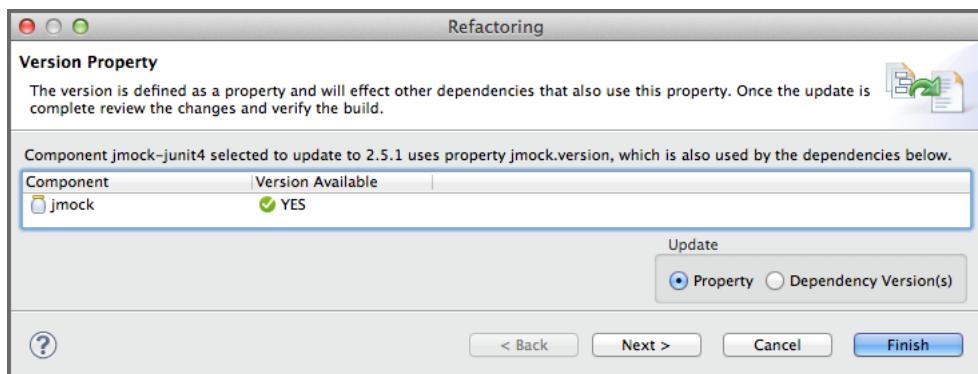


Figure 7.12: Selecting Dependency Version or Property Upgrade

Once you have selected to perform a property upgrade, you will be able to apply it in the next screen, *Refactoring*, visible in Figure 7.13.

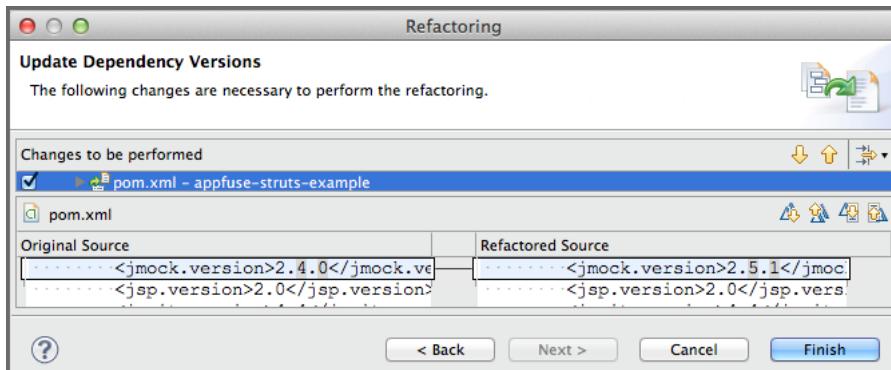


Figure 7.13: Applying a Property Upgrade

The *Refactoring* screen features navigation tools allowing you to view all potential changes in the dialog, and step through them one by one before deciding to continue.

After you have completed the refactoring of your project files, you should perform a full build, as well as a thorough test, to determine that you can proceed with the new version in your development.

Typically smaller version changes will have a higher chance of working without any major refactorings, or adaptations, of your code base and projects, while larger version changes potentially give you more new features or bug fixes.

Your release cycle, customer demands, production issues and other influencing factors, will determine your version upgrade choices. You might decide a multi-step approach, where you do a small version upgrade immediately to resolve current issues and then work on the larger upgrade subsequently to get the benefits of using a newer version. Or, you might be okay with doing an upgrade to the latest available version straight away. Potentially, a combination of approaches in different branches of your source code management system is used to figure out the best way of going forward with the upgrade.

Sonatype CLM for Eclipse and other tools of the Sonatype CLM suite can assist you through the process of upgrading, as well as monitoring, the applications after upgrade completion.

7.6 Conclusion

After reading this chapter, you should be familiar with:

- IDEs that Sonatype CLM supports.
- Sonatype CLM for IDE installation and usage.

The CLM lifecycle begins with development, and that's why we believe this is a critical point where developers must have access to information that lets them understand which components they should be using. In the same light, a developer should also be able to see what options are available, and when necessary, be able to communicate the necessity of components that may violate policy.

This approach means that problems are identified and resolved early. Unfortunately, this is in stark contrast with many development models where code is scanned near the end, and a developer is scolded for choices made. Obviously, it's easy to spot where problems might arise.

Sonatype CLM aims to change this, and the best representation of that is with Sonatype CLM for the IDE.

Chapter 8

Sonatype CLM for Repository Managers

8.1 Introduction

Repository managers allow you to manage software components required for development, deployment, and provisioning and fulfill a central role for component lifecycle management. A repository manager greatly simplifies the maintenance of your own internal repositories and access to external repositories. Using a repository manager is a recommended best practice for development efforts using Apache Maven or other build systems with declarative and automated transitive dependency management.

By proxying external repositories as well as providing a deployment target for internal components, a repository manager becomes the central and authoritative storage platform for all components. You can completely control access to, and deployment of, every component in your organization from a single location. It allows you to control, which components get into your products from external sources as well as examine, and keep track of artifacts produced by your build systems.

In terms of the incoming components a repository manager allows you to secure the connection to an external repository and ensure that your component usage is not publicly exposed.

Just as Source Code Management (SCM) tools are designed to manage source artifacts, repository managers have been designed to manage and track external dependencies and components generated by your build. They are an essential part of any enterprise or open-source software development effort. They enable greater collaboration between developers and wider distribution of software bring increased build performance due to local component availability and reduced bandwidth needs by avoiding repeated

downloads to your setup.

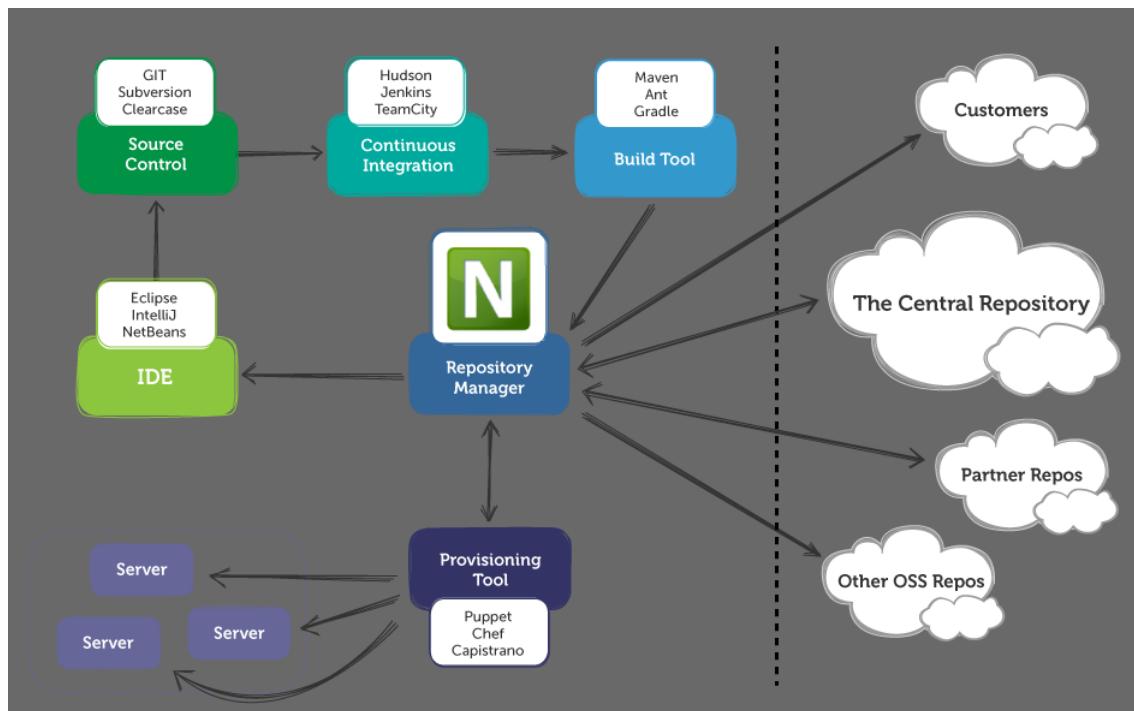


Figure 8.1: The Central Role of A Repository Manager in Your Infrastructure

Note

The book *Repository Management with Nexus* provides an extensive [introduction to repository management](#), its advantages, and stages of adoptions for further reference.

8.2 Nexus Pro - Sonatype CLM Edition

Sonatype Nexus is a powerful repository manager available as open source edition, [Nexus Open Source](#), as well as a fully supported, commercial edition, [Nexus Professional](#).

Both provide features such as

- Hosting repositories
- Proxying remote repositories
- Deployment target for third-party components
- Secure access to the Central Repository
- Grouping proxy and hosted repositories as well as snapshot and release repositories for simplified client configuration
- Hosting component documentation web sites
- Fine-grained security model
- LDAP integration
- Component search

Extensible documentation about Nexus features as well as instructions for installation, configuration and usage are available in the free book *Repository Management with Nexus* available at <http://www.sonatype.com/-Support/Books/Repository-Management-with-Nexus>.

Nexus exposes all components via HTTP and can therefore be easily integrated with other tools. For more powerful integration than component retrieval, Nexus can be integrated by facilitating the REST API, used by the Nexus user interface and provided to other integrations. For more Nexus internal extension, the creation of additional plugins provides a wealth of possibilities.

TIP

The Nexus Professional Edition is using the same Nexus core as the open source edition and merely adds further functionality with additionally installed plugins.

The additional features provided by Nexus Professional include:

- Procurement Suite for component availability control
- Staging Suite for controlled release process and build promotion
- Enhanced LDAP support and integration with Atlassian Crowd
- Maven settings.xml management
- User account self serve
- Component validation and verification

8.3 Nexus Pro and Sonatype CLM Integration

8.3.1 Introduction

Nexus comes in two forms, the popular Nexus Open Source , as well as industry-leading Nexus Professional. In addition, users of Nexus Professional can add the Nexus CLM License to expand functionality to include use of Sonatype CLM as part of Nexus Professional staging capabilities. This allows you to enjoy a robust repository manager coupled with the advanced policy and risk management features provided by Sonatype CLM.

In this section we'll discuss all the capabilities provided by the integration of Nexus Professional and Sonatype CLM. When necessary, we will indicate if a feature is exclusive to a Nexus Professional CLM Edition.

Note

If you are unsure of which Nexus License you have, please contact our Support Team at support@sonatype.com.

8.3.2 Repository Health Check (RHC) vs. Sonatype CLM

It's likely, even as a user of Nexus Open Source, that you have seen some of the capabilities of Repository Health Check. For those that haven't, Repository Health Check (RHC) is a tool included within Nexus providing users with a quick glance at component properties in a repository. The results include a top level view of security vulnerabilities and license characteristics. Users of Nexus Professional are provided with security and license information as well as age and popularity data when searching for components. All this information is available in Nexus for manual searches and interaction with Nexus. There is however no automation available and no direct relationship to your software exists besides the fact that it's build accesses Nexus.

Sonatype CLM allows you to identify applications within your business. These applications can then be evaluated throughout the software development life cycle. This includes during development in your IDE, at build time in your CI server, and during the release phases in your repository manager.

With each evaluation of an application, components will be identified, and in the cases where components can be matched to those in the Central Repository, information similar to that in RHC will be provided. An additional aspect of this evaluation is the ability to establish policy. Policy is simply a set of rules that

allows you to validate the components used in your application based on the aspects available in CLM. When a component is found to break one of these rules, a violation occurs, and these results are provided through a number of reports, all available in the Sonatype CLM Server.

Taking a step back, looking at both RHC and Sonatype CLM at a high level, RHC is a static and limited view of specific data. This can help improve your component usage, but offers limited mitigation of risk. In contrast, the features of Sonatype CLM provide a robust set of features allowing you greatly expanded control over what components are used in your applications and take advantage of automation tools throughout the different phases of your software development lifecycle.

Note

Nexus Open Source and Nexus Professional both provide access to RHC, though the capabilities are expanded for Nexus Professional users. For more information on RHC and Nexus in general, please refer to the free book [Repository Management with Nexus](#).

8.3.3 Connecting Nexus to CLM Server

The first step to enabling the features associated with Sonatype CLM is connecting to an existing Sonatype CLM Server. The Sonatype CLM Server is a separate server application that Nexus integrates with via API calls.

If this is your first time working with Sonatype CLM, and you haven't already installed and configured your Sonatype CLM Server, you will want to do that before moving forward. Instruction can be found in our [Sonatype CLM Server Install and Configuration User Guide](#).

Once your Sonatype CLM Server is installed and configured, you are ready to connect Nexus to the CLM Server. From within Nexus Professional, click on the *CLM* menu item in *Administration* section on the left of the Nexus application window. This will open the tab visible in Figure 8.2.

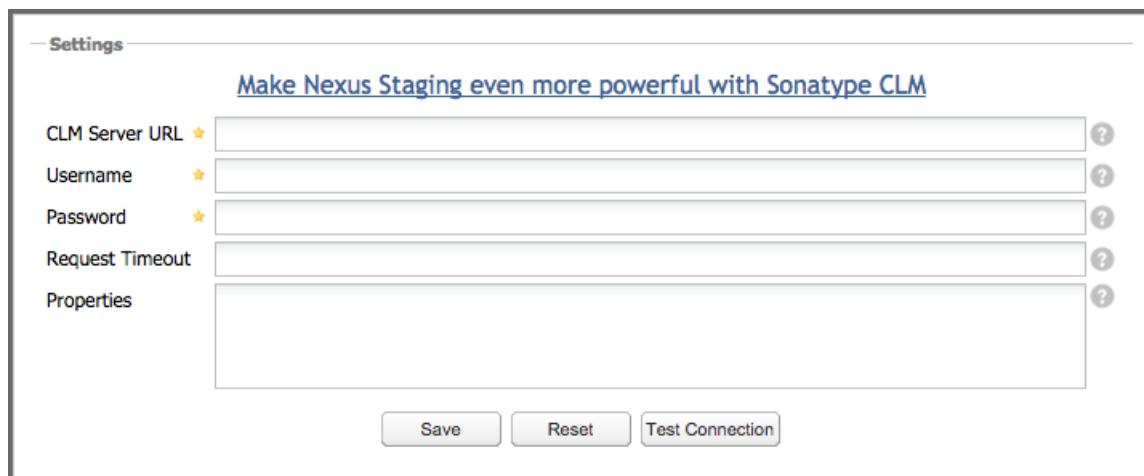


Figure 8.2: CLM configuration tab in Nexus

To configure the connection to the Sonatype CLM Server, follow these instructions:

1. Enter the URL location for your installation of the Sonatype CLM server.
2. Enter the Username and Password.

Tip

We recommend that you create a unique machine account that has access to the application(s) you wish to link to your Nexus repositories. . (*Optional*) Enter a *Request Timeout*. . (*Optional*) Enter information in the *Properties* input field using a key=value definition per line. An example is

```
procArch=false  
ipAddresses=true  
operatingSystem=false
```

These properties are passed to the CLM Server and can, for example, determine what properties are logged as part of a validation. Consult the CLM Server documentation for suitable parameters. In most use cases you will not need to configure any properties.

3. Click *Test Connection* to verify the information you have entered is correct and a connection to the CLM Server can be established.
 4. Click the *Save* button.
-

If successfully connected, a list of available applications will be displayed as seen in Figure 8.3. For more information of setting up organizations, applications, and policies, please review our [Sonatype CLM Policy Management Guide](#).

Alternatively you can enable, disable, and/or configure the Sonatype CLM integration by adding the *CLM: Configuration* capability like any other capability as documented in the [Accessing and Configuring Capabilities section](#) of the Nexus book.

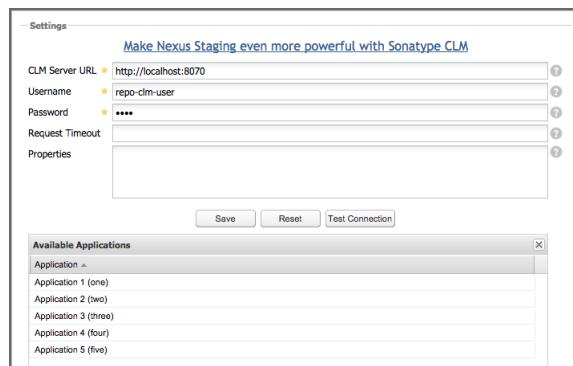


Figure 8.3: CLM configuration tab after Test Connection

Note

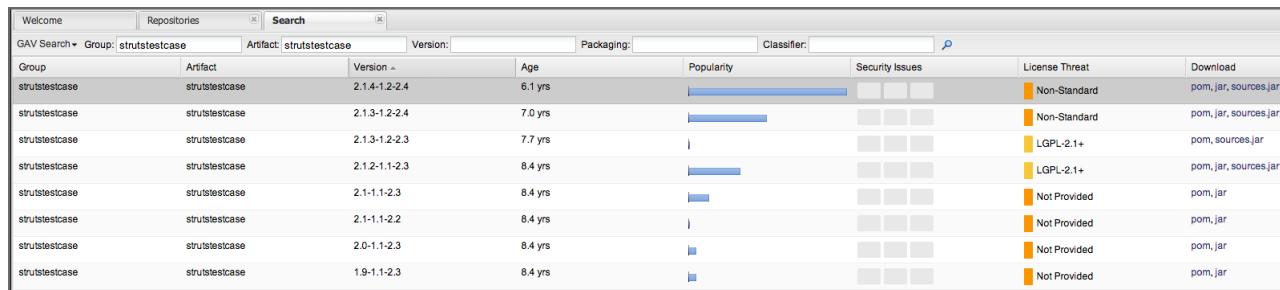
The features described here require licenses for Nexus Professional as well as Sonatype CLM Server that activate them. You can obtain them from our support team and will have to install them prior to the configuration.

8.3.4 Configuring the CLM Server

With the connection between the CLM Server and Nexus established, you can configure any organizations, applications, and policies in the CLM server. Because Nexus will be accessing the CLM server using an application identifier (App ID), you will need to configure one application for each different application use case in Nexus.

8.3.5 Accessing CLM Component Information

As a native capability, Nexus provides robust search capability for returning components that exist in your repositories. When components are returned in your search results (see below), an option to see all versions is displayed.



The screenshot shows the Nexus Pro search interface. The search bar at the top contains 'GAV Search' dropdown, 'Group: strutstestcase', 'Artifact: strutstestcase', 'Version: Version ▾', 'Packaging:', 'Classifier:', and a 'P' icon. Below the search bar is a table with the following data:

Group	Artifact	Version	Age	Popularity	Security Issues	License Threat	Download
strutstestcase	strutstestcase	2.1.4-1.2-2.4	6.1 yrs	<div style="width: 80%;">80%</div>	<div style="width: 10%; background-color: #ccc;"></div>	Non-Standard	pom, jar, sources.jar
strutstestcase	strutstestcase	2.1.3-1.2-2.4	7.0 yrs	<div style="width: 70%;">70%</div>	<div style="width: 10%; background-color: #ccc;"></div>	Non-Standard	pom, jar, sources.jar
strutstestcase	strutstestcase	2.1.3-1.2-2.3	7.7 yrs	<div style="width: 5%;">5%</div>	<div style="width: 10%; background-color: #ccc;"></div>	LGPL-2.1+	pom, sources.jar
strutstestcase	strutstestcase	2.1.2-1.1-2.3	8.4 yrs	<div style="width: 40%;">40%</div>	<div style="width: 10%; background-color: #ccc;"></div>	LGPL-2.1+	pom, jar, sources.jar
strutstestcase	strutstestcase	2.1-1.1-2.3	8.4 yrs	<div style="width: 10%;">10%</div>	<div style="width: 10%; background-color: #ccc;"></div>	Not Provided	pom, jar
strutstestcase	strutstestcase	2.1-1.1-2.2	8.4 yrs	<div style="width: 5%;">5%</div>	<div style="width: 10%; background-color: #ccc;"></div>	Not Provided	pom, jar
strutstestcase	strutstestcase	2.0-1.1-2.3	8.4 yrs	<div style="width: 5%;">5%</div>	<div style="width: 10%; background-color: #ccc;"></div>	Not Provided	pom, jar
strutstestcase	strutstestcase	1.9-1.1-2.3	8.4 yrs	<div style="width: 5%;">5%</div>	<div style="width: 10%; background-color: #ccc;"></div>	Not Provided	pom, jar

Figure 8.4: Typical Search Results in Nexus Pro

Tip

To get results that are not in the local Nexus cache, you will want to make sure the *Download Remote Index* option is enabled for the proxy repository. For guidance on this, checkout [section 6.2.4 \(specifically Fig 6.9\): Configuring Repositories](#) in the Nexus Book.

Clicking this link will display additional information in the search panel, as well as expand information available for each selected component. Depending on your Nexus license you will have one of the two options below.

RHC

Configuring an applicable repository to use RHC (Repository Health Check) will enable the repository to be analyzed by Sonatype directly, and will display (when available) security, license, age and popularity data. Details are provided in the Component Info tab located below the search panel.

Sonatype CLM

Configuring Nexus to connect to Sonatype CLM will provide the same information available for RHC, but will also provide additional general and policy violation information for each component.

Group	Artifact	Version ▾	Age	Popularity	Security Issues	License Threat	Download
org.apache.struts	struts2-core	2.3.8	1.3 yrs	<div style="width: 10%;">10%</div>	<div style="background-color: #f08080; width: 10%; height: 10px;"></div> <div style="background-color: #ffcc00; width: 5%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar
org.apache.struts	struts2-core	2.3.7	1.4 yrs	<div style="width: 10%;">10%</div>	<div style="background-color: #f08080; width: 10%; height: 10px;"></div> <div style="background-color: #ffcc00; width: 5%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar
org.apache.struts	struts2-core	2.3.4.1	1.6 yrs	<div style="width: 10%;">10%</div>	<div style="background-color: #f08080; width: 10%; height: 10px;"></div> <div style="background-color: #ffcc00; width: 5%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar
org.apache.struts	struts2-core	2.3.4	1.8 yrs	<div style="width: 10%;">10%</div>	<div style="background-color: #f08080; width: 10%; height: 10px;"></div> <div style="background-color: #ffcc00; width: 7%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar
org.apache.struts	struts2-core	2.3.3	1.9 yrs	<div style="width: 10%;">10%</div>	<div style="background-color: #f08080; width: 10%; height: 10px;"></div> <div style="background-color: #ffcc00; width: 7%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar
org.apache.struts	struts2-core	2.3.16.1	17 d	<div style="width: 15%;">15%</div>	<div style="width: 10%; height: 10px;"></div> <div style="width: 10%; height: 10px;"></div> <div style="width: 10%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar
org.apache.struts	struts2-core	2.3.16	108 d	<div style="width: 20%;">20%</div>	<div style="width: 10%; height: 10px;"></div> <div style="width: 10%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar
org.apache.struts	struts2-core	2.3.15.3	154 d	<div style="width: 10%;">10%</div>	<div style="width: 10%; height: 10px;"></div> <div style="width: 10%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar
org.apache.struts	struts2-core	2.3.15.2	181 d	<div style="width: 10%;">10%</div>	<div style="width: 10%; height: 10px;"></div> <div style="width: 10%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar
org.apache.struts	struts2-core	2.3.15.1	247 d	<div style="width: 10%;">10%</div>	<div style="width: 10%; height: 10px;"></div> <div style="width: 10%; height: 10px;"></div>	Apache-2.0	pom, jar, sources.jar, javadoc.jar

Figure 8.5: Nexus Search Showing All Versions

Note

Nexus search is only available for open source Java components.

For now, we'll focus on the additional information available through Sonatype CLM. To access this, you need to click on the Component Info tab. It is located just below the displayed search results, to the right of the directory tree for the selected component.

The screenshot shows the Sonatype CLM interface. At the top, there is a search bar with fields for Group (org.apache.struts), Artifact (struts2-core), Version (2.3.8), and Packaging. Below the search bar is a table displaying search results for struts2-core across various versions (2.3.8, 2.3.7, 2.3.4.1, 2.3.4, 2.3.3, 2.3.16.1, 2.3.16). The table includes columns for Group, Artifact, Version, Age, Popularity, Security Issues, License Threat, and Download. The security issues column shows counts for critical (red) and high (orange) vulnerabilities. The license threat column shows Apache-2.0 for all entries. The download column lists file types: pom, jar, sources.jar, javadoc.jar. On the left, a sidebar shows a tree view of Maven repositories under 'Viewing Repository: Central', with '2.3.8' selected. On the right, a panel titled 'Component Info' displays details for the selected version: Group: org.apache.struts, Artifact: struts2-core, Version: 2.3.8, Extension: jar. It also shows an XML dependency block:

```
<dependency>
<groupId>org.apache.struts</groupId>
<artifactId>struts2-core</artifactId>
<version>2.3.8</version>
</dependency>
```

Figure 8.6: Accessing the Component Info Tab

Note

Only users that are logged in will be able to see the Component Info tab.

Clicking on the Component Info tab will display a drop down list of applications associated with your Sonatype CLM Server. Once you have selected an application, the Component Information Panel (CIP), similar to what is provided via the Application Composition Report and CLM for Eclipse, will be displayed.

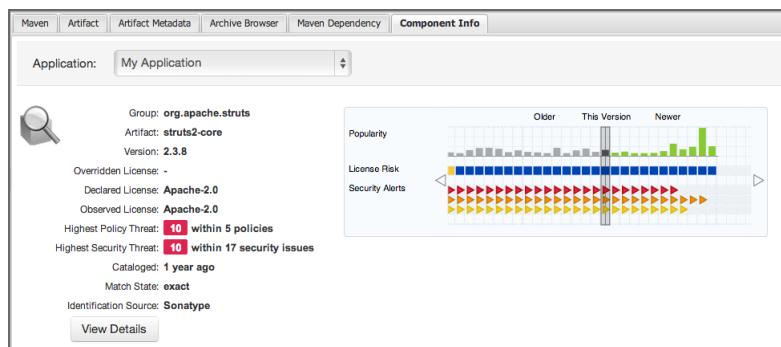


Figure 8.7: Component Information Panel

Note

Information on the Component Info tab requires a Sonatype CLM License. Nexus Pro Users will simply be provided with additional details regarding the security vulnerabilities and license issues. Those using Nexus Open Source will not have access to the Component Info tab.

8.3.6 The Component Information Panel (CIP)

As mentioned above, when the Component Information Panel is first displayed, you will need to select an application corresponding to your application on the CLM Server. This application will not change until you select a new one.

The Component Information Panel is divided into two areas. On the left side is component data, which includes information related to the component itself. To the right of the component information, a graphical display of any security or license issues, as well as popularity data for each version of the component is displayed. By default the current version of the component is selected. In the event there are more versions than can be displayed, arrows on the right and left allow for scrolling to newer or older versions. In addition, you can click on any of these versions (if available), which will change the information that is displayed on the left of the CIP.

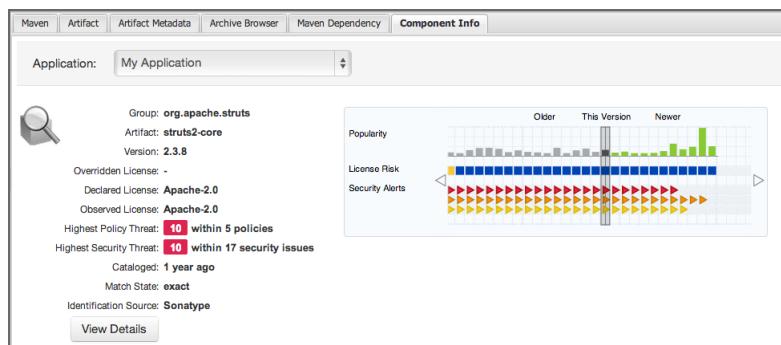


Figure 8.8: Component Information Panel Example

Note

In the screenshot above, we have sized the panels in Nexus to make all CIP information visible. By default the view will allow you to vertically scroll to view all information.

The textual information on the left includes:

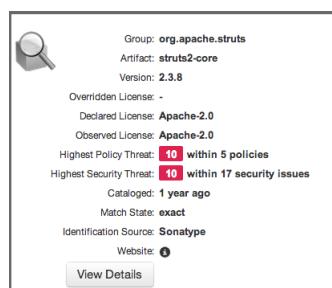


Figure 8.9: CIP Text

Coordinates

The identifying information for a component.

Overridden License

If you have chosen a different license for the component, it will be displayed here. This could e.g. be the case if you have purchased a license for a component allowing distribution, while the component is originally GPL.

Declared License

Any license that has been declared by the author.

Observed License

Any license(s) found during the scan of the component's source code.

Highest Policy Threat

The highest threat level policy that has been violated, as well as the total number of violations.

Highest Security Threat

The highest threat level security issue and the total number of security issues.

Cataloged

The age of the component based on when it first was uploaded to the Central Repository.

Match State

How the component was matched (exact, similar, or unknown).

Identification Source

Whether a component is identified by Sonatype, or claimed during your own process.

Website

If available, an information icon providing a link to the project is displayed.

The graph itself is laid out like a grid, with each vertical piece representing a particular version. The selected version being identified by a vertical line. The information displayed in the graph includes:

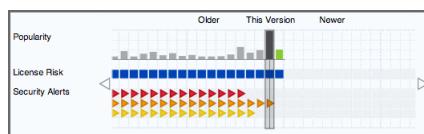


Figure 8.10: CIP Graph

Popularity

The popularity for each version is shown as a bar graph. The larger the graph the more popular the version.

License Risk

This will display the license risk based on the application that is selected, and the associated policy and/or license threat groups for that application. Use the application selector to change the application, and corresponding policies the component should be evaluated against.

Security Alerts

For each version, the highest security threat will be displayed by color, with the highest shown as red, and no marker indicating no threat.

8.3.7 Component Details (CLM)

In addition to the security vulnerability and license issue details provided, any particular policy violations for a component will be displayed as well. This can be helpful in determining if a component will meet the standards for component lifecycle management your company has established.

To view these details, click on the *View Details* button located below the Component Information.

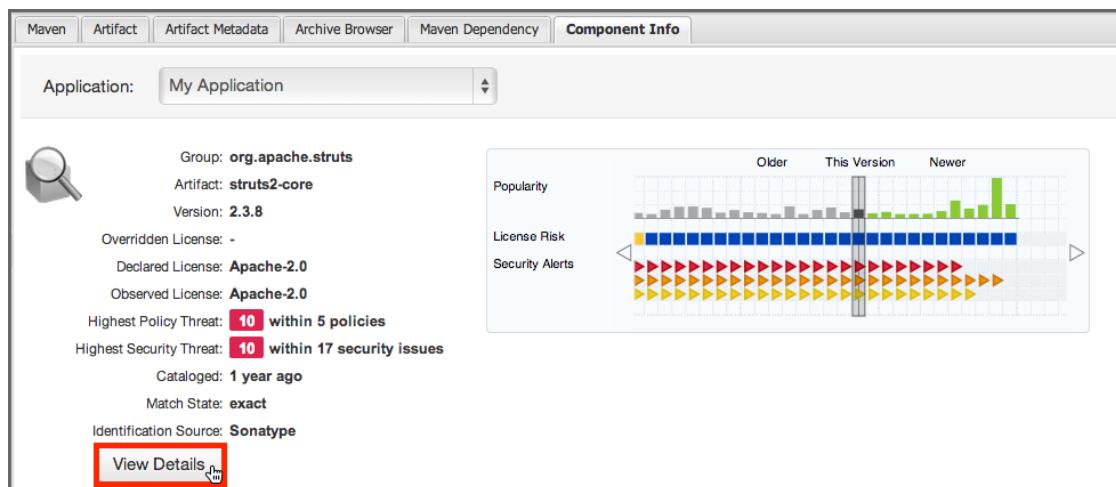


Figure 8.11: View Details Button

This will create a new tab in the main Nexus panel with the label CLM Detail.

The screenshot shows the Sonatype CLM application interface. At the top, there are tabs: Welcome, Search, CLM Detail, and CLM Detail (active). Below the tabs, the title is "CLM Details for org.apache.struts:struts2-core:2.3.16 in the context of CLM Application My Application".

Policy Violations:

Policy	Constraint	Summary
Security-Medium	CVSS >=4 and <7	Found 2 Security Vulnerabilities with Severity >= 4 Found 2 Security Vulnerabilities with Severity < 7 Found 2 Security Vulnerabilities with Status OPEN

License Analysis:

Threat Level	Declared License(s)	Observed License(s)
Liberal	Apache-2.0	Not Provided

Security Issues:

Threat Level	Problem Code	Status	Summary
5	CVE-2014-0094	Open	The ParametersInterceptor in Apache Struts before 2.3.16.1 allows remote attackers to "manipulate" the ClassLoader via the class parameter, which is passed to the getClass method.
	OSVDB-103918	Open	Apache Commons FileUpload ParametersInterceptor ClassLoader Manipulation Remote DoS

Figure 8.12: View Details

Note

In order to see the details for additional components, select another component from the search results, or select a different version in the CIP, and then click the *View Details* button.

8.4 Using CLM for Staging

8.4.1 Introduction

CLM for staging in Nexus combines the powerful controls for your release process from Nexus with the rich information and validation available in the CLM Server. Using them together you can ensure that any releases you produce are actively and automatically validated against up to date information in terms of security vulnerabilities and license characteristics of all the components you use and any whitelists or blacklists you maintain as well as other policies you have defined are enforced.

You will need to have completed the following items before using CLM with Nexus Staging. This includes:

On the CLM Server

- Created an Organization
- Created an Application
- Created a Policy

In Nexus CLM

- Created a Staging Profile

Note

Before using CLM for staging you should be familiar with the general setup and usage patterns of the Nexus Staging Suite documented in [the chapter on staging](#), located in the Nexus book. There, you will be guided through the process to get Nexus prepared to handle your staging needs.

8.4.2 Staging Profile Configuration

As mentioned in the note above, you should already have your staging profile configured. This configuration can then be used for a staging profile or a build promotion profile by configuring the *CLM Application* field in the Staging Profile.

The figure below shows an example staging profile with a CLM application configured.

NXS301

Profile ID	12aaba0a60ad0611
Deploy URL	http://localhost:8081/nexus/service/local/staging/deploy/maven2
Profile Name	<input type="text"/> NXS301
Profile Selection Strategy	<input type="text"/> Explicit or Implicit - selected by ID or Nexus will calculate match
Searchable Repositories	<input checked="" type="checkbox"/>
Staging Mode	<input type="text"/> Deploy and UI Upload
Template	<input type="text"/> Maven2 (hosted, release)
Repository Target	<input type="text"/> NXS-301
Release Repository	<input type="text"/> Releases
CLM Application	<input type="text"/> Example
CLM Application Management	
Content Type	<input type="text"/> maven2

Figure 8.13: Staging Profile with a CLM Application Configured

8.4.3 Policy Actions

While not a requirement for using CLM with Nexus staging, CLM does have the ability to Fail or Warn on staging closure. This is managed by setting the *Stage Release* and *Release* actions for each policy. These policy actions can be configured to warn, fail, or do nothing (default). The figure below provides an example policy that would warn for a staging deployment and fail a release.

Edit Policy

Name	OlderThan1year	Threat Level	3		
Constraints	OlderThan1year	<input type="button"/> <input type="button"/> <input type="button"/>			
Actions	Stage <input type="button"/>	Fail	Warn	Do Nothing	Notify
				✓	👤 0
				✓	👤 0
				✓	👤 0
			✓		👤 0
	✓				👤 0
				✓	👤 0

Figure 8.14: Staging and Release Configuration for a Policy in the CLM Server

Configuration of Policy Actions is managed via the Sonatype CLM Server. While we'll cover the basic settings below, for instruction on setting these actions, please review the Policy Management Guide, specifically the section on managing policy actions.

The configuration of the *Stage Release* action of a policy in the CLM Server is used for closing the staging repository. Based on the action chosen, the staging repository will respond as follows:

- If the policy action is set to *Fail*, when a policy is violated, the staging repository closing fails.
- If the policy action is set to *Warn*, when a policy is violated, the staging repository closes successfully, but a warning will be produced.
- If the policy action is set to *Do Nothing*, the staging repository closes successfully regardless of any policy violations.

8.4.4 Release Repository Actions

As with CLM and policy, Nexus also has actions specific to the *Release* feature, and these can be configured to fail, warn or do nothing and are used for releasing or promoting the staging repository.

Once the staging profile is configured with the CLM application identifier any deployment triggers a CLM policy evaluation, which will be visible as *Activity* for the staging repository. Any rule failures are provided with further information in the detail panel. Figure 8.15 displays a staging repository with CLM rule validations and a failure. The *View Full Report* button links back to the Sonatype CLM Server, which displays the detailed Application Composition Report.

The screenshot shows the 'Staging Repository' interface. In the top navigation bar, there are buttons for Refresh, Close, Promote, Release, and Drop. A 'Filter by profile' dropdown is also present. Below the navigation is a table with columns: Repository, Profile, Status, Updated, and Description. Two repositories are listed: 'catchall-009' (Profile: CatchAll, Status: open, Updated: 2013-Apr-10 23:27:04) and 'nxs301-008' (Profile: NXS301, Status: closed, Updated: 2013-Apr-10 23:12:13). The 'catchall-009' row is selected. The main content area shows the 'Activity' tab selected. On the left, a tree view lists activity steps: 'Activities' (open, close), 'Evaluating rules: clm', 'Evaluating rule: clm', 'Failed: clm' (which is highlighted in grey), '1 rule failed: clm', 'Evaluating rules: Default Always Run', 'Evaluating rule: Repository Writable', 'Passed: Repository Writable', 'All rules passed: Default Always Run', and 'Close failed'. To the right, a summary box displays an event: 'Event: Failed: clm' (Wednesday, April 10, 2013 23:27:04 PDT (GMT-0700)). It also shows 'Validation failed.' and 'Found 28 violations in 28 components'. A red box indicates '7 CRITICAL' and an orange box indicates '21 SEVERE'. A blue 'View Full Report' button is at the bottom right.

Figure 8.15: Staging Repository Activity with a CLM Evaluation Failure and Details

8.5 Using Sonatype CLM for Maven

Sonatype CLM for Maven provides some additional, ancillary features for Nexus. These are described in [Creating a Component Info Archive for Nexus Pro CLM Edition](#).

8.6 Conclusion

In general, this chapter should provide you with a basic overview of Repository management, and more specifically repository management using Nexus Pro. More importantly, you should now understand the best way to utilize the integrated features provided by Nexus Pro - Sonatype CLM Edition. This includes:

- Connecting Nexus to the CLM Server
- Configuring the CLM Server
- Using CLM for Staging.

Remember, if this is your first introduction to Sonatype Nexus, or even repository managers in general, be sure to review our [Sonatype Nexus book](#). There is a wealth of information, that expands beyonds the goals of this chapter.

Chapter 9

Sonatype CLM for SonarQube

9.1 Introduction

Sonatype CLM integrates with a wide range of external enforcement points that include [continuous integration servers](#) (Hudson/Jenkins), the [IDE](#) (Eclipse), and [repository management](#) (Nexus). This is in addition to the Sonatype CLM [stand-alone/command line scanner](#) and [Maven plugin](#).

The enforcement points are a common aspect of the development lifecycle, and in Sonatype CLM, each represents a unique stage. This creates an invaluable integration of Sonatype CLM with industry standard tools that already make the lives of your business and development process even better. This also means, your team has greater overall control in identifying and reducing open source component risk.

Better component usage doesn't just lead to risk reduction though, it also leads to better applications. This is something that ties closely with code analysis, and tools such as [SonarQube](#).

As a user of SonarQube, you know first hand the impact that principles such as the 7 Axes of Code Quality can have on the applications and projects your teams create. Paralleling this, as a user of Sonatype CLM you also know how policy management is a critical and essential part of open source component usage.

Sonatype CLM for SonarQube brings both of these together, and in this guide we'll cover everything you need to get going as quickly as possible. This includes:

- Download, installation, and configuration
- Application Composition Report access

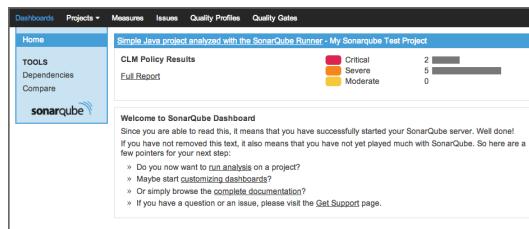


Figure 9.1: SonarQube Overview

Note

This guide assumes that you have installed and are running the [Sonatype CLM Server](#). You must have at least one [organization and an application](#) created, as well as at least [one policy](#) the application can be evaluated against.

9.2 Sonatype CLM for SonarQube Requirements

SonarQube

3.7.4 (LTS) 4.3.2 4.4

Java

1.6 to 1.8

9.3 Downloading, Installing, and Configuring

As mentioned in the introduction there are a few things that must be done prior to getting the Sonatype CLM for SonarQube functional. This includes:

- Installed and configured the Sonatype CLM Server

- Created an organization, and at least one application
- Evaluated the application at least once
- Have an existing SonarQube project

With these items completed, you can download Sonatype CLM for SonarQube from our [Sonatype CLM downloads page](#).

Note

Sonatype CLM for SonarQube supports the [latest](#) and [LTS \(long-term-support\)](#) versions.

9.3.1 Install Sonatype CLM for SonarQube

Once downloaded, find the `extensions>plugins` directory in your installation of SonarQube. Next, copy the Sonatype CLM for SonarQube JAR file (the one just downloaded from the link above) into this directory. Finally, start your SonarQube instance, and log in with your administrator account.

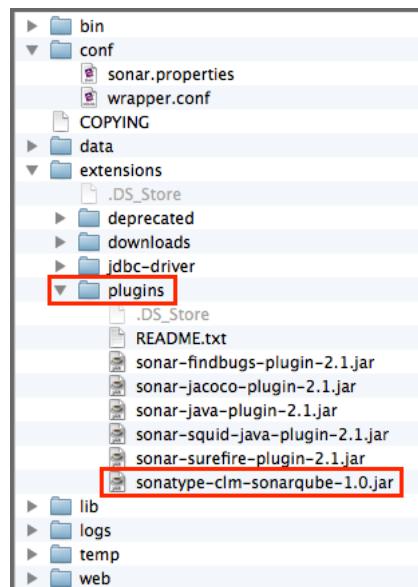


Figure 9.2: SonarQube Plugin Directory

Note

If your installation of SonarQube is running, stop it before adding the plugin.

9.3.2 Configure Sonatype CLM Server Settings

The Sonatype CLM Server settings allow you to specify the location of your CLM server. In the example below, basic defaults for configuration have been used. Yours will likely be different.

1. From the main SonarQube interface, click on the *Settings* menu item. This is located in the upper right corner of *SonarQube Home Page*.



Figure 9.3: SonarQube Settings Menu

2. On the left hand side, in the *Configuration menu*, click on *CLM Settings*.

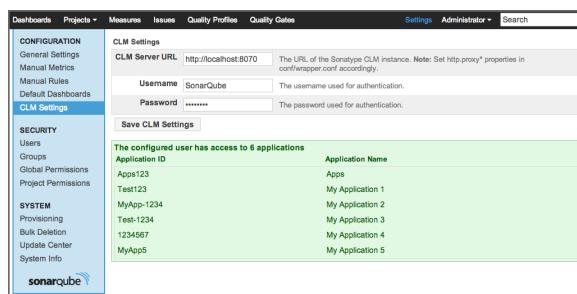


Figure 9.4: SonarQube CLM Server Settings

3. Enter the details for your Sonatype CLM Server location, as well as the user name and password that is at least a member of the developer role for the application you wish to associate with this SonarQube project.

Note

These settings will be used across all projects for your SonarQube installation. Because of this we suggest creating a single account in Sonatype CLM for SonarQube, and then associating that account with the Developer role for the applications you will be linking to SonarQube.

4. Click the *Save CLM Settings* button to save your Sonatype CLM settings, and then return to the SonarQube Dashboard home.

9.3.2.1 A Special Note About Proxy Configuration

In some instances, your CLM server may be setup behind a proxy. If this is the case, be sure to have your SonarQube admin configure your proxy via wrapper.conf file located within the conf directory of your SonarQube installation.

Within this file you will need to add several parameters to the *Java Additional Parameters* section. Here's an example of how this configuration might look.

```
wrapper.java.additional.7=-Dhttp.nonProxyHosts=disable-default- ←  
    nonproxyhosts  
wrapper.java.additional.8=-Dhttp.proxyHost=192.168.2.97  
wrapper.java.additional.9=-Dhttp.proxyPort=8888
```

Tip

For more information on adding additional java properties, we suggest an internet search for *additional parameters wrapper tanukisoftware*.

9.3.3 Select the CLM Application

Now, you are ready to select the application that is associated with your SonarQube project.

1. Open the project you want to associate the application with, and then click the *Configuration* menu located just below the SonarQube Search field. A menu will drop down; Choose *Sonatype CLM*.

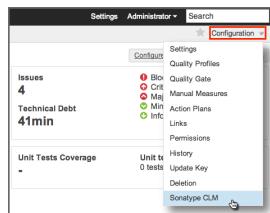


Figure 9.5: SonarQube Sonatype CLM Configuration Menu

2. You will now see the Sonatype CLM Configuration Area. This consists of a drop down menu allowing you to see all Sonatype CLM applications that the Sonatype CLM user account you entered earlier has access to. Choose the application that should be associated to your SonarQube Project.

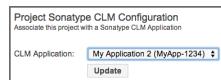


Figure 9.6: SonarQube Sonatype CLM Application Selection

3. Click the *Update* button.

9.3.4 Add and Configure the Sonatype CLM Widget

The final step is to add the Sonatype CLM Widget to your SonarQube project. This is done from the *SonarQube Widget Configuration area*.

1. Click on the *Configure widgets* link located just below and to the left of the SonarQube main search field (upper right of SonarQube page).



Figure 9.7: SonarQube Configure Widgets Menu

2. The easiest way to find the Sonatype CLM Report Summary widget is by using the SonarQube

widget search (just enter Sonatype). Click on the *Add widget* button to add the widget to your Home page.

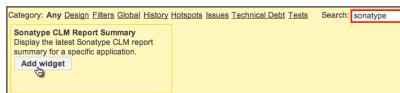


Figure 9.8: SonarQube Search for CLM Widget

3. Next, click on the *Edit* link in the top right of the Sonatype CLM Report Summary widget box. Several options will display.

- a. Select the *Project* you want to see Sonatype CLM data in.

Tip

The option to select a project is only available when adding the widget from a non-project-specific dashboard.

- b. Enter a *Title*. This will appear above the summary information for the Sonatype CLM data.
 - c. Choose the *CLM Stage*. The Sonatype CLM stage selected affects which Application Composition Report will be used to display summary-level data. Be sure to pick the stage that best represents the state of your application when it is scanned by SonarQube. *Default* will use the *Build stage*.

Note

Due to technical constraints, the dropdown option also includes stages that might not be available for your Sonatype CLM license. Selecting any of those will however yield an error when accessing the Sonatype CLM server.

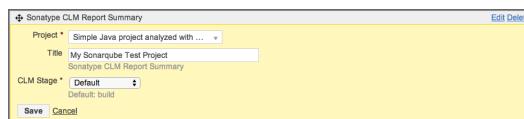


Figure 9.9: SonarQube Configure Sonatype CLM Widget options

4. Click the *Save* button to save your selections.

9.4 Accessing the Application Composition Report

Within SonarQube, you will be provided with basic summary information for the Application, as well as a link to the associated Application Composition Report. To access the detailed information provided by this report, click on the *Full Report* link displayed in the Sonatype CLM Report Summary widget in your project.

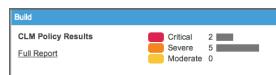


Figure 9.10: SonarQube Sonatype CLM Widget Example

9.5 Conclusion

By now, you should have Sonatype CLM for SonarQube installed, and you should be seeing information from the corresponding Application Composition Report. There really isn't much more to it, and now you have seamless analysis of your open source component usage right inline with all the information provided by SonarQube.

Just to recap, here are a few of the topics covered regarding the Sonatype CLM for SonarQube:

- Download, installation, and configuration
- Application Composition Report access

Chapter 10

Sonatype CLM for CLI

10.1 Introduction

While the best integration between Sonatype CLM is through the fully supported tools (e.g. Nexus, Eclipse, and Hudson/Jenkins), any application can be evaluated against your Sonatype CLM policies simply by using Sonatype CLM for CLI (aka Stand-alone).

Before you get started, there are a few things you should make sure you have, including:

- A general familiarity with the CLI (you don't need to be an expert, but basic knowledge helps).
- Installed and set up the Sonatype CLM Server
- Set up an organization and application
- Created or imported a policy for your application, or the organization that contains your application.

Note

With regard to integrating Sonatype CLM for CLI with CI servers, you should also have a familiarity with the way your particular CI utilizes build steps to launch a simple script.

10.2 Downloading Sonatype CLM for CLI

To use Sonatype CLM for CLI, first download the jar file named similar to `sonatype-clm-scanner-1.7.0-02.jar` from the [Sonatype Support website](#) and place the file in its own directory.

Note

Be sure to remember where you placed the file you downloaded. As a recommendation, it's best to have Sonatype CLM for CLI in its own directory, and not shared with the Sonatype CLM Server.

10.3 Locating Your Application Identifier

Before you start an evaluation, you need to have your Application ID. To get this...

1. Log into your Sonatype CLM server with a user account with at least a developer role for the application you plan on evaluating.
2. Click the Manage Organizations and Applications icon .
3. Click on *Applications* in the menu on the left to display a list of applications, and then click on the application you want to find the Application ID for. You will see a screen similar to Figure 10.1
4. Locate the text underneath the application name. The application identifier is the text between *Application* and *[organization name]*

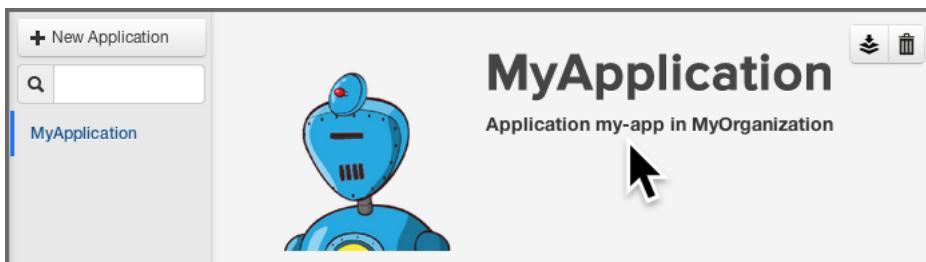


Figure 10.1: Application Overview and Application Identifier

10.4 Evaluating an Application

Now that you have Sonatype CLM for CLI set up, you are ready to evaluate an application. As a Java application, it can be started using the `java` command, and adding the necessary parameters. The syntax below represents the minimum set of options required to evaluate an application:

```
java -jar [scanner jar] -i [application id] -s [server URL] [target]
```

scanner jar

This is the path to Sonatype CLM for CLI (scanner) jar file e.g. `./sonatype-clm-scanner.jar`.

--authentication

Using the switch `-a`, enter the user name:password (e.g. `MyUserName:MyUserPassword`).

Note

Authentication will permit (or prevent) the ability to submit an application for evaluation, as well as retrieve the summary results and URL. At this time, it is not required.

--application-id

Using the switch `-i`, enter the application id for your application (see instructions above).

--server-url

Using the switch `-s` enter the location of your CLM server (e.g. `http://localhost:8070`).

Target

This is the path to a specific application archive file or a directory containing such archives. A number of formats are supported, including `jar`, `war`, `ear`, `tar`, `tar.gz`, `zip` and many others.

Tip

Listed in the options below, you can specify the specific CLM stage. However, if you do not include this option the system will default to the Build stage.

10.4.1 Additional Options

There are several additional options that can be used in the construction of the syntax for evaluating an application with Sonatype CLM for CLI.

--fail-on-policy-warnings

using the switch `-w` will cause a failure of the evaluation if any warnings are encountered. By default, this is set to false.

--ignore-system-errors

Using the switch `-e`, allows you to ignore any system errors (e.g. IO, Network, server, etc.). This is most helpful when using Sonatype CLM for CLI with continuous integration servers, as these errors can cause the unintentional failure of a build.

--proxy

Using the switch `-p`, you can specify a proxy to use in connecting to the CLM Server. The format is `<host[:port]>`.

--proxy-user

Using the switch `-U`, you can specify credentials for the proxy. The format is `<username:password>`.

--result-file

Using the switch `-r`, you can specify the name and location of a JSON file that will store the results of the policy evaluation in a machine-readable format.

--stage

Using the switch `-t`, you can specify the Sonatype CLM stage you wish the report to be associated with. This is an optional parameter, and if it is not specified, the report will be associated with the Build stage by default.

Note

At this time only the Build, Stage Release, and Release stages will display a report in the CLM Reports Dashboard. For a full list of stages, use the CLI help provided with the tool.

10.5 Example Evaluation

In an example scenario, let's say you have copied the `sonatype-clm-scanner.jar` as well as the application you want to examine to a specific directory e.g. `~/clm-test`. The application's filename is `sample-application.zip`.

To evaluate this application you have to identify the Sonatype CLM Application ID and supply it with the `-i` switch as well as supply the URL of your CLM server with `-s`. As an option, and what is demonstrated below, you can also specify a particular stage.

The full command line for an Application ID `Test123` and a URL of `http://localhost:8070` is

```
java -jar ./sonatype-clm-scanner.jar -i Test123 -s http://localhost:8070  
-t release sample-application.zip
```

To access help content for Sonatype CLM for CLI, run it without supplying parameters:

```
java -jar ./sonatype-clm-scanner.jar
```

Go ahead and try an evaluation yourself. Sonatype CLM for CLI will accept a number of file types, including jar, war, and zip files. If your evaluation is successful, the log output of the command execution will provide a summary as well as a link to the produced results similar to:

```
[INFO] Policy Action: Warning  
[INFO] Summary of policy violations: 4 critical, 85 severe, 46 moderate  
[INFO] The detailed report can be viewed online  
at http://localhost:8070/ui/links/application/my-app/report/95c4c14e
```

Application Name ▾	Build Violations	Stage Release Violations	Release Violations	Contact	Organization
MyApplication	28 159 3	28 159 3			My Organization
My Application 4		6 5			My Organization 3
My Application 3	6 11 1				My Organization 7
My Application 2	6 11 1	6 11 1	6 11 1	John Smith	My Organization 4

Figure 10.2: Violations Report After an Evaluation

Note

If using Sonatype CLM for CLI, and you kept our defaults, the report will be listed under Build Violations. You should see something similar to the results displayed in Figure 10.2.

10.6 Using Sonatype CLM for CLI with a CI Server

We won't be covering a specific CI here, but in general, all you need to identify (in your CI), is the location for adding a build step that includes processing a simple shell script during the building of your application.

Once you are there, make sure your script calls Sonatype CLM for CLI using the following syntax:

```
java -jar [ScannerJar] -i [AppID] -e [IgnoreSystemErrors] -w [←  
FailOnPolicyWarning] -s [ServerURL] [Target]
```

Each of the areas in the syntax above have been described in the previous section [Evaluating an Application](#).

Given a typical setup, your syntax, including all available options will likely look similar to this:

```
java -jar /scanner/sonatype-clm-scanner.jar -i tester123 -s  
http://localhost:8070 ./target/sample-app.war
```

Now, when your application is built, the build step you have added will call Sonatype CLM for CLI, evaluate your application, and upload results of the evaluation to Sonatype CLM Server. By default this will be placed below the build column in the Reports and Application area on the Sonatype CLM Server, for your application.

Note

We advise you to use a separate application identifier for each of your unique applications. Using the same application identifier will result in report results being overwritten each time an application is built. While this is always the case, matching the latest evaluation to the right application can prove difficult.

10.7 Conclusion

How did evaluating an application go? Pretty simple right?

As we've mentioned before, evaluating an application is the essence of Sonatype CLM, and the tools

available right inside the CLM Server, or even the stand-alone scanner, provide quick and effective ways to get results without needing to interact with other enforcement points.

That said, these tools work best when you are only looking to evaluate a few applications. If you have hundreds, or maybe even thousands, of applications to evaluate, you are going to want to look into integrating an enforcement point (e.g. Sonatype CLM for Hudson/Jenkins).

Chapter 11

Sonatype CLM for Maven

11.1 Introduction

Sonatype CLM for Maven allows users to evaluate any Maven-based software projects, in the same way our integrated tools (e.g. Nexus Pro, Eclipse, Hudson/Jenkins) do.

This means you can access the same robust, reporting features no matter what toolset you use. It can be run on a command line interface and can therefore be executed on any continuous integration server, as well as a number of popular IDEs.

How you use the Sonatype CLM for Maven plugin widely depends on how you enforce policy. However, in general, when using the plugin on a multi-module project in most cases you will only configure an execution for the modules that produce components that will be deployed as an application.

Typically these are `ear` files or `war` files for deployment on application servers or `tar.gz` or other archives that are used for production deployments or distribution to users. That said, you can also analyze all modules of a project. Again, this will largely depend on what your CLM policy is enforcing and what you want to validate.

In the following sections, we'll provide details on these goals and their usage:

Index

The `index` goal of the plugin allows you to prepare data for analysis with Sonatype CLM for CI.

Attach

The `attach` goal aids your integration with Sonatype Nexus CLM Edition and the release process using the staging tools of Nexus.

Evaluate

The `evaluate` goal can trigger an evaluation directly against a Sonatype CLM server.

Note

The `help` goal provides documentation for all the goals and parameters and you can invoke it with an execution like `mvn com.sonatype.clm:clm-maven-plugin:help`

11.2 Creating a Component Index

When evaluating a Maven-based software project, Sonatype CLM for Maven can take advantage of the dependency information contained in the project's `pom.xml` files and the information about transitive dependencies available to Maven.

The `index` goal of Sonatype CLM for Maven allows you to identify component dependencies and makes this information available to Sonatype CLM CI tools (e.g. Sonatype CLM for Hudson/Jenkins or Bamboo). You can invoke an execution of the `index` goal manually as part of your command line invocation by executing the `index` goal after the `package` phase:

```
mvn clean install com.sonatype.clm:clm-maven-plugin:index
```

Alternatively you can configure the execution in the `pom.xml` files `build` section or in a profile's `build` section.

```
<build>
  <plugins>
    <plugin>
      <groupId>com.sonatype.clm</groupId>
      <artifactId>clm-maven-plugin</artifactId>
      <version>2.1.1</version>
      <executions>
        <execution>
          <goals>
            <goal>index</goal>
```

```
</goals>
</execution>
</executions>
</plugin>
</plugins>
</build>
```

With the above configuration a normal Maven build execution with e.g. mvn clean install will trigger the CLM plugin to be executed in the package phase and result in a log output similar to

```
[INFO] --- clm-maven-plugin:2.1.1:index (default) @ test-app ---
[INFO] Saved module information to /opt/test-app/target/sonatype-clm/ ←
module.xml
```

If you want to manually configure the lifecycle phase to execute the plugin, you have to choose a phase after package.

The generated `module.xml` file contains the information that will be picked up by Sonatype CLM for CI and incorporated into the CLM evaluation. This improves the analysis since Sonatype CLM for Maven is able to create a complete dependency list rather than relying on binary build artifacts.

Note

By default only dependencies in the `compile` and `runtime` scopes will be considered, since this reflects what other Maven packaging plugins typically include. Dependencies with the scopes `test`, `provided` and `system` must be manually added, and are described in the [Evaluating Project Components with Sonatype CLM Server section](#).

11.2.1 Excluding Module Information Files in Continuous Integration Tools

When using the Sonatype CLM Maven plugin and the `index` goal, module information files are created. If desired, you can exclude some of the modules from being evaluated. For example, you may want to exclude modules that support your tests, and don't contribute to the distributed application binary.

The default location where the module information files are stored is `${project.build.directory} /sonatype-clm/module.xml`.

In the supported CI tool, you will see a section labeled *Module Excludes*. On this area, use a comma-

separated list of [Apache Ant styled patterns](#) relative to the workspace root that denote the module information files (`**/sonatype-clm/module.xml`) to be ignored.

Here's an example of the pattern described above:

```
**/my-module/target/**, **/another-module/target/**
```

If unspecified, all modules will contribute dependency information (if any) to the evaluation.

11.3 Creating a Component Info Archive for Nexus Pro CLM Edition

The `attach` goal scans the dependencies and build artifacts of a project and attaches the results to the project as another artifact in the form of a `scan.xml.gz` file. It contains all the checksums for the dependencies and their classes and further meta information and can be found in the `target/sonatype-clm` directory. A separate `scan.xml.gz` file is generated for each maven module in an aggregator project in which the plugin is executed.

This attachment causes the file to be part of any Maven `install` and `deploy` invocation. When the deployment is executed against a Sonatype Nexus CLM Edition server the artifact is used to evaluate policies against the components included in the evaluation.

To use this goal, add an execution for it in the POM, e.g. as part of a profile used during releases:

```
<build>
  <plugins>
    <plugin>
      <groupId>com.sonatype.clm</groupId>
      <artifactId>clm-maven-plugin</artifactId>
      <version>2.1.1</version>
      <executions>
        <execution>
          <goals>
            <goal>attach</goal>
          </goals>
        </execution>
      </executions>
    </plugin>
  </plugins>
</build>
```

Once configured in your project, the build log will contain messages similar to

```
[INFO] --- clm-maven-plugin:2.1.1:attach (default) @ test-app ---
[INFO] Starting scan...
[INFO] Scanning ...plexus-utils-3.0.jar
[INFO] Scanning ...maven-settings-3.0.jar...
[INFO] Scanning target/test-app-1.0-SNAPSHOT.jar...
[INFO] Saved module scan to /opt/test-app/target/sonatype-clm/scan.xml.gz
```

The attachment of the `scan.xml.gz` file as a build artifact causes it to be stored in the local repository as well as the deployment repository manager or the Nexus staging repository ending with `-sonatype-clm-scan.xml.gz`. This file will be picked up by Sonatype Nexus CLM Edition and used in the policy analysis during the staging process. It improves the analysis since Sonatype CLM for Maven is able to create a complete dependency list rather than relying on binary build artifacts.

11.4 Evaluating Project Components with Sonatype CLM Server

The `evaluate` goal scans the dependencies and build artifacts of a project and directly submits the information to a Sonatype CLM Server for policy evaluation.

If a policy violation is found and the CLM stage is configured to `Fail`, the Maven build will fail. If invoked for an aggregator project, dependencies of all child modules will be considered.

The `evaluate` goal requires the Sonatype CLM Server URL as well as the application identifier to be configured. Optionally a CLM stage can be configured.

The command line arguments are:

clm.serverUrl

the URL for the CLM server, this parameter is required.

clm.serverId

used for authentication and must match the id given to the CLM Server [specified in your Maven settings](#).

clm.username

the username used to authenticate access to the CLM server.

Note

This is not required when using `clm.serverId`, but can be used to overwrite those settings.

clm.password

the password for the username indicated above.

Note

This is not required when using `clm.serverId`, but can be used to overwrite those settings.

clm.applicationId

the application identifier for the application to run policy against, this parameter is required

clm.resultFile

the path for specifying the location of a JSON file where the following information will be stored:

- `applicationId` : Application ID
- `scanId` : Organization ID
- `reportHtmlUrl` : URL to the HTML version of the report
- `reportPdfUrl` : URL to the PDF version of the report
- `reportDataUrl` : URL to the Data version of the report (for use via CURL, or similar tool)

clm.stage

the stage to run policy against with the possible values of `develop`, `build`, `stage-release`, `release` and `operate` with a default value of `build`.

clm.additionalScopes

the additional scopes you would like CLM to include components from during the evaluation. Values include `test`, `provided`, and `system`. In cases where you want to include more than one of these, separate the list using a comma (see examples below).

An example invocation is:

```
mvn com.sonatype.clm:clm-maven-plugin:evaluate -Dclm.additionalScopes=test ←  
,provided,system -Dclm.applicationId=test -Dclm.serverUrl=http:// ←  
localhost:8070
```

You can avoid specifying the parameters on the command line by adding them to your `settings.xml` or `pom.xml` as properties.

```
<properties>
  <clm.serverUrl>http://localhost:8070</clm.serverUrl>
  <clm.applicationId>test</clm.applicationId>
</properties>
```

Alternatively the invocation can be configured in a `pom.xml` file:

```
<build>
  <plugins>
    <plugin>
      <groupId>com.sonatype.clm</groupId>
      <artifactId>clm-maven-plugin</artifactId>
      <version>2.1.1</version>
      <executions>
        <execution>
          <goals>
            <goal>evaluate</goal>
          </goals>
          <phase>package</phase>
          <configuration>
            <serverUrl>http://localhost:8070</serverUrl>
            <stage>build</stage>
            <applicationId>test</applicationId>
            <additionalScopes>test,provided,system</additionalScopes>
          </configuration>
        </execution>
      </executions>
    </plugin>
  </plugins>
</build>
```

Sonatype CLM for Maven can be executed against an aggregator project. When executed in an aggregator project, it calculates the dependencies and transitive dependencies of all child modules and takes all of them into account for the policy evaluation. It is advisable to set the `inherited` flag for the plugin to `false` to avoid duplicate runs of the plugin in each module.



Caution

When bound to a lifecycle in a multi-module build, the plugin will take all dependencies of the Maven reactor into consideration for its analysis and not just the dependencies of the current module.

The `evaluate` goal logs its activity and provides the location of the generated report.

```
[INFO] --- clm-maven-plugin:2.1.1:evaluate (default) @ test-app ---
[WARNING] Goal 'evaluate' is not expected to be used as part of project lifecycle.
[INFO] Starting scan...
[INFO] Scanning ../repository/org/codehaus/plexus/plexus-utils/3.0/plexus-
      utils-3.0.jar...
[INFO] Scanning ../repository/org/apache/maven/maven-settings/3.0/maven-
      settings-3.0.jar...
[INFO] Scanning target/test-app-1.0-SNAPSHOT.jar...
[INFO] Saved module scan to /opt/test-app/target/sonatype-clm/scan.xml.gz
[INFO] Uploading scan to http://localhost:8070 ...
[INFO] Evaluating policies... (ETA 5s)
[INFO] Policy Action: None
Summary of policy violations: 0 critical, 0 severe, 0 moderate
The detailed report can be viewed online at
http://localhost:8070/ui/links/application/test/report/f4582a1570634dc2ac8
```

After a successful build the report can be accessed in the Sonatype CLM server under the application that was configured. A direct link is provided on the log.

11.5 Authentication

To configure authentication to the CLM Server, you will need to add your Sonatype CLM Server information to your Maven `settings.xml` file:

```
<settings>
  ...
  <servers>
    <server>
      <id>clm_server</id>
      <username>my_clm_login</username>
      <password>my_clm_password</password>
    </server>
  ...
</servers>
...
</setting>
```

Note

In our example we have not encrypted our password. This is generally recommended. The Apache Maven project provides [instructions](#) for password encryption. Additionally, username and password can still be specified at the command line, and will be used in place of these settings.

11.6 Simplifying Command Line Invocations

If you happen to use the plugin frequently by running it manually on the command line and want to shorten the command line even more, you can add a plugin group entry to your Maven `settings.xml` file:

```
<settings>
  ...
  <pluginGroups>
    <pluginGroup>com.sonatype.clm</pluginGroup>
    ...
  </pluginGroups>
  ...
</settings>
```

This enables you to invoke the plugin using its shorthand prefix form:

```
mvn ... clm:index
```

11.7 Skipping Executions

The `clm.skip` parameter can be used, when a CLM plugin execution is configured in your project's `pom.xml` file, but you want to avoid the execution for a particular build. An example execution is

```
mvn clean install -Dclm.skip=true
```

The parameter can also be set in your IDE configuration for Maven build executions or as a property in your `settings.xml` or `pom.xml`:

```
<properties>
  <clm.skip>true</clm.serverUrl>
</properties>
```

11.8 Using Sonatype CLM for Maven with Other IDEs

While the integration with Eclipse offered by Sonatype CLM for IDE is the most powerful tooling for developers available, user of other popular integrated development environments are not left without support. All common Java IDEs have powerful integration with Apache Maven and therefore can be used together with Sonatype CLM for Maven to evaluate projects against your Sonatype CLM server.

This chapter showcases the integration with [IntelliJ IDEA](#) from JetBrains and [NetBeans IDE](#) from Oracle.

11.8.1 Maven Plugin Setup

In our example setup for the usage with other IDE's we are going to add a plugin configuration for Sonatype CLM for Maven into the `pom.xml` file of the project we want to analyze as documented in [Example Configuration of Sonatype CLM for Maven](#). This configuration defines the `serverUrl` of the CLM server to be contacted for the evaluation, the `applicationId` used to identify the application in the CLM server to evaluate against and the `stage` configuration to use for the evaluation.

Example Configuration of Sonatype CLM for Maven

```
<build>
  <pluginManagement>
    <plugins>
      <plugin>
        <groupId>com.sonatype.clm</groupId>
        <artifactId>clm-maven-plugin</artifactId>
        <version>2.1.1</version>
        <configuration>
          <serverUrl>http://localhost:8070</serverUrl>
          <applicationId>test</applicationId>
          <stage>develop</stage>
        </configuration>
      </plugin>
    </plugins>
  </pluginManagement>
</build>
```

With this configuration in place a user can kick off an evaluation with the command line `mvn package clm:evaluate`.

This will result in an output detailing the components to be analyzed, any policy violations and a link to the resulting report in the Sonatype CLM server.

Note

To speed the build up you can skip the test compilation and execution by passing `-Dmaven.test.skip=true` on the command line invocation, since it is not needed for the CLM evaluation.

11.8.2 IntelliJ IDEA

IntelliJ IDEA supports Maven projects natively and you can simply open a project in the IDE by opening the `pom.xml` file.

Once your project is opened and you have added the plugin configuration for Sonatype CLM for Maven from [Example Configuration of Sonatype CLM for Maven](#), you can create a configuration to run the desired Maven command.

Select *Edit Configurations* from the *Run* menu, press the **+** button and select *Maven* to add a new configuration. Enter the command line and other desired details as displayed in Figure 11.1

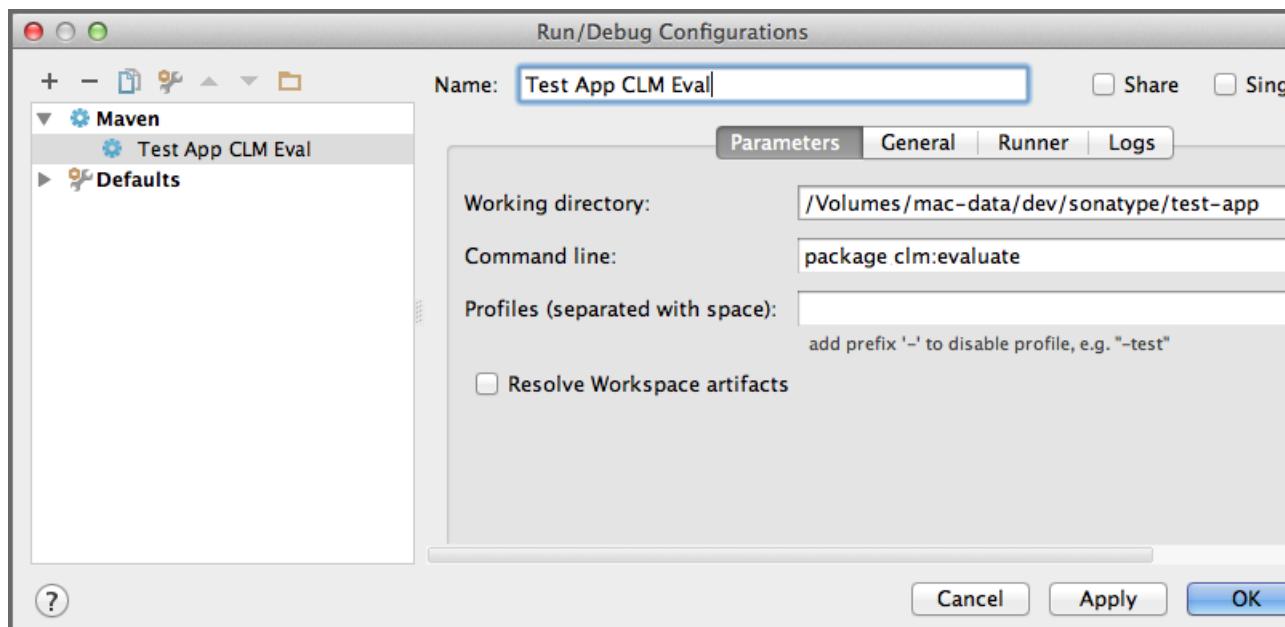


Figure 11.1: Creating a Maven Run Configuration for a CLM Evaluation in IntelliJ

After pressing *OK* in the dialog the new configuration will be available in the run configuration drop down as well the *Maven Projects* view. You can open the view using the *View* menu, selecting *Tools Window* and pressing *Maven Projects*. You will see the window appear in the IDE looking similar to Figure 11.2. It displays the run configuration selector with the green play button on the top as well as the Maven project with the CLM evaluation run configuration.

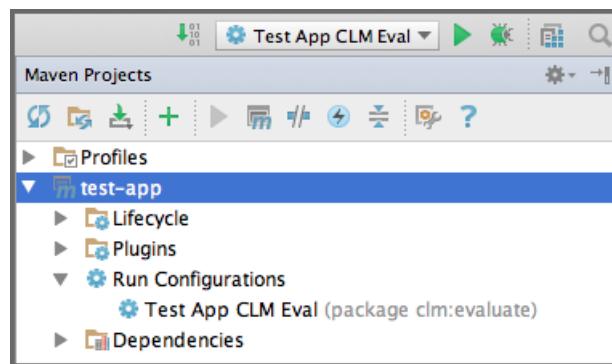
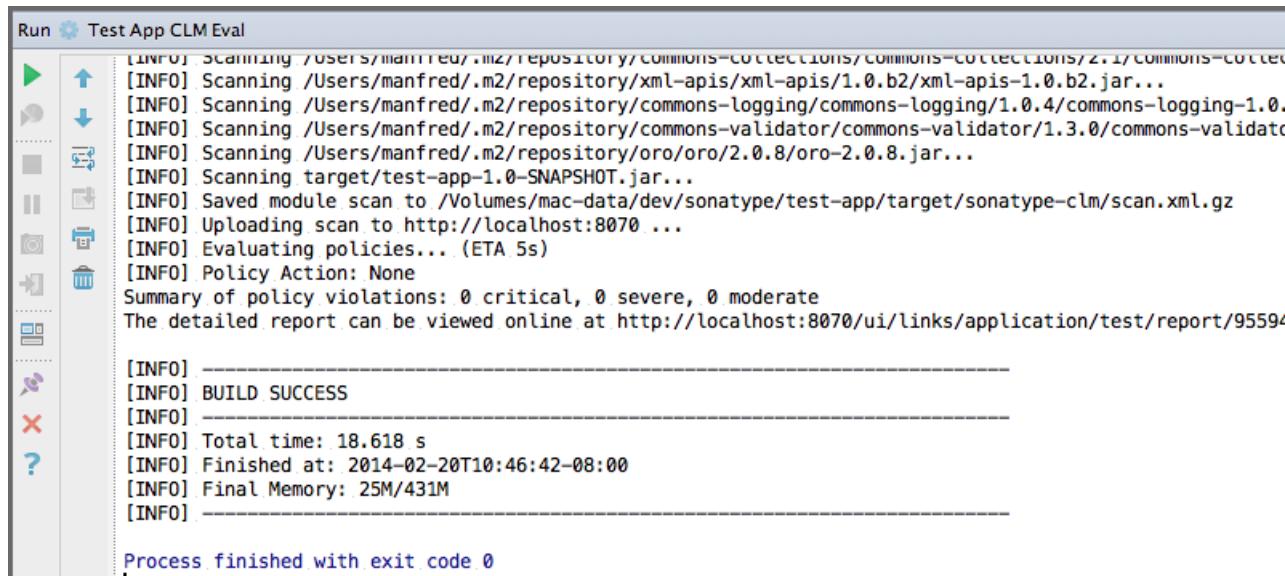


Figure 11.2: Maven Projects View with the CLM Evaluation Run Configuration in IntelliJ

You can press the green play button beside the run configuration, or the configuration entry itself in the *Maven Projects* window, to start a build. The build will run in an embedded console window in the IDE as displayed in Figure 11.3, and show all the output from the Maven build including any error messages and the link to the produced report in the Sonatype CLM server. Policy violations can be configured to result in a build failure.



The screenshot shows the IntelliJ Run Console with the title "Run Test App CLM Eval". The console output is as follows:

```
[INFO] Scanning /Users/manfred/.m2/repository/commons-collections/commons-collections/2.1/commons-collections-2.1.jar...
[INFO] Scanning /Users/manfred/.m2/repository/xml-api/xml-api/1.0.b2/xml-api-1.0.b2.jar...
[INFO] Scanning /Users/manfred/.m2/repository/commons-logging/commons-logging/1.0.4/commons-logging-1.0.4.jar...
[INFO] Scanning /Users/manfred/.m2/repository/commons-validator/commons-validator/1.3.0/commons-validator-1.3.0.jar...
[INFO] Scanning /Users/manfred/.m2/repository/oro/oro/2.0.8/oro-2.0.8.jar...
[INFO] Scanning target/test-app-1.0-SNAPSHOT.jar...
[INFO] Saved module scan to /Volumes/mac-data/dev/sonatype/test-app/target/sonatype-clm/scan.xml.gz
[INFO] Uploading scan to http://localhost:8070...
[INFO] Evaluating policies... (ETA 5s)
[INFO] Policy Action: None
Summary of policy violations: 0 critical, 0 severe, 0 moderate
The detailed report can be viewed online at http://localhost:8070/ui/links/application/test/report/95594

[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 18.618 s
[INFO] Finished at: 2014-02-20T10:46:42-08:00
[INFO] Final Memory: 25M/431M
[INFO] -----
Process finished with exit code 0
```

Figure 11.3: CLM for Maven Output in the Run Console in IntelliJ

11.8.3 NetBeans IDE

NetBeans IDE supports Maven projects natively and you can simply open a project in the IDE by choosing *Open Project* from the *File* menu and navigating to the directory that contains your project.

Once your project is opened, you can expand the *Project Files* section in the *Projects* window as displayed in Figure 11.4. Double-click on the `pom.xml` file and add the plugin configuration for Sonatype CLM for Maven from [Example Configuration of Sonatype CLM for Maven](#).

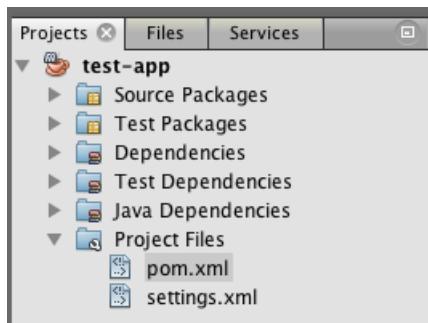


Figure 11.4: Project View with the `pom.xml` in NetBeans

If you right-click on the `pom.xml` file, you can choose *Run Maven* and *Goals*, to display the dialog displayed in Figure 11.5. Enter the configuration as displayed and don't forget to select *Remember as:* providing a name. This will allow you to simply start this defined configuration from the *Run Maven* context menu of the `pom.xml` file.

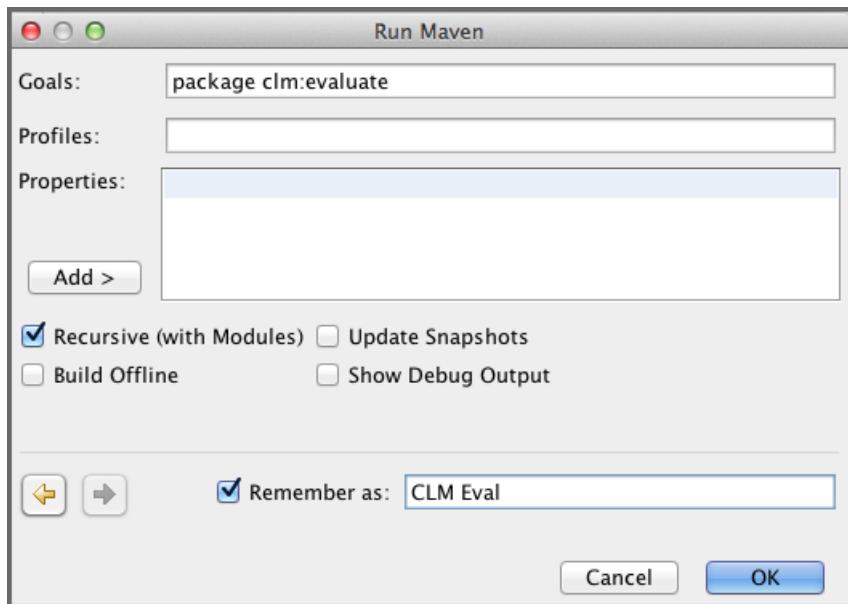
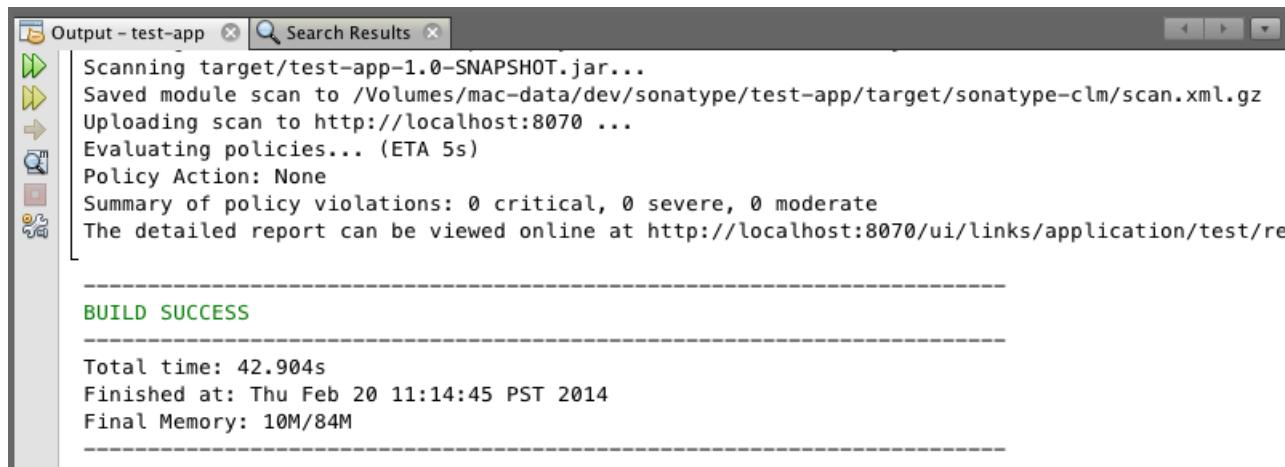


Figure 11.5: Maven Goal Setup for a CLM Evaluation in NetBeans

After pressing *OK* the defined Maven execution will start and display the output including any error messages and the link to the produced report in the Sonatype CLM server in the Output window displayed in Figure 11.6. Policy violations can be configured to result in a build failure.



```
Output - test-app x Search Results x
Scanning target/test-app-1.0-SNAPSHOT.jar...
Saved module scan to /Volumes/mac-data/dev/sonatype/test-app/target/sonatype-clm/scan.xml.gz
Uploading scan to http://localhost:8070 ...
Evaluating policies... (ETA 5s)
Policy Action: None
Summary of policy violations: 0 critical, 0 severe, 0 moderate
The detailed report can be viewed online at http://localhost:8070/ui/links/application/test/re

-----
BUILD SUCCESS
-----
Total time: 42.904s
Finished at: Thu Feb 20 11:14:45 PST 2014
Final Memory: 10M/84M
-----
```

Figure 11.6: CLM for Maven Output in the Output Window in NetBeans

11.9 Conclusion

As you likely discovered, the Sonatype CLM for Maven plugin not only provides direct command line Maven functionality, but can extend the existing features of tools that already have direct Sonatype CLM integration. For example did you look at our section on using the index goal to create a list of dependencies for your project?

When it comes down to it, Sonatype CLM for Maven allows you to ensure any Maven-based project meets your team's desire of reducing risk in association with open source component usage. Even if you are already using the Sonatype CLM functionality, exploring the capabilities of Sonatype CLM for Maven is still a good idea.

Take a look at a few of the key take aways to make sure you didn't miss anything:

- Creating a Component Index
- Evaluating a Maven Project from the Command Line

- Integrating with various IDEs (e.g. Netbeans, IntelliJ IDEA)

Appendix A

Copyright

Copyright © 2011-2013 Sonatype, Inc. All rights reserved.

Online version published by Sonatype, Inc,

Nexus™, Nexus Professional™, and all Nexus-related logos as well as Sonatype CLM are trademarks or registered trademarks of Sonatype, Inc., in the United States and other countries.

Java™ and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle, Inc., in the United States and other countries.

IBM® and WebSphere® are trademarks or registered trademarks of International Business Machines, Inc., in the United States and other countries.

Eclipse™ is a trademark of the Eclipse Foundation, Inc., in the United States and other countries.

Apache and the Apache feather logo are trademarks of The Apache Software Foundation.

Linux® is the registered trademark of Linus Torvalds in the U.S. and other countries.

Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and Sonatype, Inc. was aware of a trademark

claim, the designations have been printed in caps or initial caps.

While every precaution has been taken in the preparation of this book, the publisher and authors assume no responsibility for errors or omissions, or for damages resulting from the use of the information contained herein.